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ADHERENT PERICARDIUM AND PICK'S SYNDROME*

An Autopsy Study

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IN 1896 Friedel Pick reported three cases of mediastinopericarditic pseudocirrhosis of the liver studied at autopsy, one of which was correctly diagnosed before death. This syndrome of constricting pericarditis and recurrent ascites has been since then associated with his name although he was by no means the first in its description. There has appeared in the thirty-five years since Pick's report an extensive literature on the subject in which the two chief problems discussed have been the etiology of the condition and the relationship between pericardial disease and the not uncommonly associated polyserositis and pseudocirrhosis.

Therapy of the disease has languished for part of this time and with it the diagnosis, a notoriously difficult problem, but with the recent experimental work in the production of pericardial disease and its relief by surgical resection of the pericardial scar as demonstrated by Beck, there has been a renewal of interest in it. European surgeons until the last few years have been the leaders in the actual operative technique through the work of Brauer, Delorme, Rehn, von Schmieden, Sauerbruch and others. Churchill in 1929 collected reports from the literature of 37 operations for decortication of the heart (Delorme) for pericardial adhesion. In this paper he noted a very successful operative result which he obtained in the case of a patient followed by us for several years at the Massachusetts General Hospital. Sprague and White in 1931 reported five cases, including this one, recently operated on with satisfactory relief of symptoms in three and a mortality of 40%. Among patients with cardiac disease no cure is so nearly complete as that following a successful operation for constricting pericarditis unless it be the relief afforded by surgery in some cases of thyrocardiac disease. Our surgical results from the operations of Dr. Edward Churchill and Dr. Wyman Whittemore have led us to survey the autopsy material at the Massachusetts General Hospital since 1896 (including one case of 1893) in relation to the incidence of adhesive pericarditis and Pick's disease. It so happens that this period almost coincides with the history of pericardial surgery in this hospital, since it was on November 24, 1895 that Dr. C. B. Porter performed the first operation on the pericardium for sepsis.

Our special study included, first, the material from 1900 autopsies performed between January, 1921 and April, 1931. In 1913 William H. Smith reported on a similar study of 3053 necropsies from 1897 to 1913 and in 1926 Cabot reviewed the necropsy experience from 1896 to 1919. To complete the entire thirty-five years our series was extended to include the year 1920.

One purpose of this review was to discover the frequency of the Pick syndrome, and to find, if possible, cases for which surgery might have held out some hope of relief had the diagnosis been made. The immediate problem, however, was to discover what justification there was for recommending pericardial resection following the subsidence of acute rheumatic pericarditis to prevent the later development of crippling pericardial synechiae. An analysis of the ten year series from 1921 to 1931 is presented.

INCIDENCE OF PERICARDIAL ADHESIONS AT THE MASSACHUSETTS GENERAL HOSPITAL

In the 1900 autopsies studied 43 cases of pericardial adhesion were found; twenty-five showed complete obliteration of the pericardial sac and eighteen showed partial obliteration or bands of adhesion between visceral and parietal layers. Two cases showed extensive parietal adhesions to the chest wall or diaphragm combined with complete obliteration of the pericardial cavity. Pleuropericardial adhesions were present in eleven cases of which eight had complete, and three partial, obliteration of the pericardium. The incidence of chronic pericarditis was 2.26% of all autopsies. This is similar to Cabot's finding of 114 cases in 4000 autopsies at the Massachusetts General Hospital from 1896 to 1919 (2.8%). We are not including cases showing nothing but a few old adhesions between pleura and pericardium. In

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100 serially autopsied cases we found that 14 per cent had such fibrous bands.

In spite of the number of cases of chronic pericarditis autopsied in 10 years, it was of interest to us to discover that no case of Pick's disease was found among them. This at once impressed us with the rarity of the condition, at least at the autopsy table in a hospital not primarily treating chronic disease. A comparison with the discharge diagnoses of the hospital cases over a period from 1923 through 1930 showed, however, that the diagnosis of chronic mediastinopericarditis had been made clinically five times (exclusive of the five other proved cases reported by Sprague and White in 1931). Further analysis of this 1923 to 1930 clinical group showed no case proved at autopsy, but did reveal two living in which the diagnosis appeared to us correct. Two of the other three were probably incorrectly diagnosed and the fifth case was proved at necropsy to have been wrongly diagnosed because in spite of recurrent ascites the pericardium, great veins, and liver were normal. No case having a discharge diagnosis of "polyserositis" has been in the Massachusetts General Hospital since 1927.

ETIOLOGY. RHEUMATISM

Eighty per cent of the 43 autopsied cases of adherent pericardium had associated heart disease. The most common of these was rheumatic heart disease. Twenty cases of this type occurred in the series and two others with complete obliteration of the pericardial cavity had a clear history of rheumatic infection but no valvular deformity. In the rheumatic group four had had influenza and two had had pneumonia.

In the presence of rheumatic valvular disease and the inevitable myocardial involvement of these cases the pericardial adhesion appeared to play a secondary part in the picture of congestive failure and in no case could it be held to be true constricting pericarditis. Of these 22 patients 13 died from cardiac causes, two from subacute bacterial endocarditis and in seven the heart was not primarily responsible for the death. Interest is attracted to the obliterative pericarditis of the two cases without valvulitis. One died at the age of 56 with pernicious anemia, and one at 21 with chronic nephritis and uremia. Adherent pericardium was not suspected in either and the pericarditis was "vestigial" as termed by Cabot.

OTHER ASSOCIATED CARDIAC DISEASE

Thirteen patients are included in the remaining group with cardiac disease. Nine had significant hypertension, in four combined with coronary disease and in one with coronary disease and lues. One other case had lues combined with coronary disease. Coronary sclerosis was diagnosed in nine cases.

The cause of the adhesions in this group was undeterminable from the history or the pathological examination. Pneumonia appeared in the past history of three, influenza in two, and chronic nephritis in one. One had terminal miliary tuberculosis.

ASSOCIATED NON-CARDIAC DISEASE

The group of the eight remaining patients showed various causes of death, only one related to the heart. Seven of these were over 65 years of age and the eighth died of bronchopneumonia at 41. One looks in vain in the histories of aged patients to find adequate cause for chronic pericardial disease which has never caused symptoms. The pericardium was completely adherent in five cases and calcified in one. The causes of death and the ages were as follows: chronic asthma and auricular fibrillation (76), terminal erysipelas from a varicose ulcer (70), nephrectomy for hypernephroma (65), lobar pneumonia (84), Addison's disease (66), bronchopneumonia (41), amputation for gangrene and infection (77), and operation for ovarian tumor (68).

In this group a history of previous pneumonia occurred only in the patient who died of bronchopneumonia. The only other probable etiologic factor unearthed in this group was puerperal sepsis which occurred 30 years before death in the woman dying after nephrectomy.

TUBERCULOSIS

It is evident from our figures that tuberculosis can rarely, if ever, be proved responsible for the benign pericardial adhesions found in this series. One patient with rheumatic heart disease had chronic pulmonary tuberculosis and terminal miliary tuberculosis; one other rheumatic patient had terminal miliary tuberculosis and one man of 84 with hypertension and coronary disease had terminal miliary tuberculosis. There was nothing in any of the histories as recorded which revealed chronic or arrested tuberculosis of the lungs. Eight cases showed microscopic evidence of obsolete tuberculosis in glands or lungs. Twenty-three had chronic pleuritis.

OTHER DATA

Sex. Of the entire group 27 were males and 16 females. In the rheumatic group 14 were males and 8 females; of the non-rheumatic cases 13 were males and 8 females. This incidence of 63% of males is not quite so impressive as the 72% males in Cabot's series. However, in the group of eight cases over the age of 70 six were males (75%).

Age. (Table 1.) The ages were from 13 to 84 years, the average of the entire group being 46.6 years. The average age at death of those with rheumatic valvular disease was 27 years and of the others was 62 years. Twenty-three patients, or over half of the series, were over 50 years of age. The average age at death in the rheumatic group is changed to 23.6 years if we include only those dying from cardiac cause.

It appears that the lowered age at death in this group indicates a more severe cardiac infection rather than that it shows an important burden upon the heart from the pericardial adhesion.

Cause of death. Reference has been made to some specific causes of death. In the entire series 20 died from cardiac causes. This shows that over 50% died from a cause not related to the heart and indicates that the adherent pericardium was of no importance. In no case could the pericarditis be called the primary cause of death.

TABLE 1

FORTY-THREE CASES OF ADHERENT PERICARDIUM AUTOPSIED AT THE MASSACHUSETTS GENERAL HOSPITAL, 1921-1931

Etiology	Sex M.	Sex F.	Average Age at Death	Average Heart Weight Grams
Rheumatic				
With valvular disease	12	8	27	605
Without valvular disease	2*			500
Non-Rheumatic				
With heart disease	8	5	62	491
Without heart disease	5	3		431
Total	27	16		Average 506

*One had nephritis and hypertension, and the other, pernicious anemia.

Heart weight. Twenty-six of the hearts of the entire series weighed over 500 grams; the largest was 917 grams in a case with rheumatic mitral and aortic disease. In the nine cases without a definite association with heart disease the average heart weight was 431 grams. Weights of the heart and pericardium in five cases without associated heart disease but with complete obliteration of the cavity were 330, 470, 498, 500 and 660 grams.

Diagnosis. The notorious difficulty in the diagnosis of adherent pericardium is apparent from our figures. In six cases a correct diagnosis was made before death and in six others it was suggested. The x-ray study of these cases was incomplete as is usually so in patients who are ill enough to die in the hospital. Four fluoroscopic examinations and 14 roentgenograms were made. The correct diagnosis was made once on fluoroscopy from fixation of heart and diaphragm.

As no case of Pick's syndrome was found in this series it is only natural that the diagnosis of adherent pericardium was not made more often clinically; the pericardial adhesions in these cases caused no signs or symptoms or were obscured by other disease, most frequently rheumatic valvular disease with congestive failure.

Pick's Syndrome at the Massachusetts General Hospital. The failure to find cases of mediastinopericarditis in the autopsies of the past ten years led us to investigate the experience prior to our study. Smith in 1913 reported a study of 62 cases of chronic adherent pericarditis in 3053 necropsies (2.03%) at the Massachusetts General Hospital from 1897 to 1913. Three patients had an associated perihepatitis and perisplenitis. In one, a boy of seven years, the abdomen required frequent tapping. In the other two, women of 35 and 65 years, no ascites was present. In one patient ascites was found post mortem. Cabot's series of 4000 autopsies from 1896 to 1919 revealed only one case recognized as true Pick's disease but he refers to one other which was autopsied at this hospital in 1893. It so happened, that in the short period between the end of Cabot's study and the beginning of ours one more case came to necropsy. From 1893 to 1932, a span of 40 years, only three cases of Pick's disease have been proved at autopsy at the Massachusetts General Hospital and one of these died three years before Pick's description of the syndrome.* A short review of these cases follows: (1) A boy 18 years old died at the Massachusetts General Hospital in March, 1893. He had no history of rheumatism or tuberculosis. For six years he had had enlargement of the abdomen and ascites for four years. The cause of death was pulmonary edema and exhaustion. At autopsy a completely adherent pericardium was found. The heart was not enlarged and showed no valvular disease. There was no pulmonary tuberculosis, but a cheesy nodule was found in the pericardium. The liver was greatly enlarged. (2) A woman, 23 years old, died in March, 1912 with congestive heart failure. She had painless ascites for 8 years, following mumps and pertussis. Seven years before she had been operated on at the Boston City Hospital and the peritoneum was found studded with tubercles. At autopsy a normal-sized heart with completely adherent pericardium was revealed. There was an infarct of the left lung but no pulmonary or peritoneal tuberculosis was found. Cheesy putty-like material was found in the pericardium from which it was not possible to culture tubercle bacilli. The liver weighed 1364 grams and had a markedly thickened smooth fibrous capsule. (3) The last case was a man of 29 years of age dying in June, 1920. He was said to have had pneumonia with pleurisy three years before. However, fever persisted for a year and tuberculosis seemed likely. For five weeks dyspnea and ascites had been present although he had had edema of the ankles at intervals for three

*Since this study was completed, one of the five cases of mediastinopericarditis operated on and described in the series of Sprague and White has come to autopsy. This case had completely adherent constrictive calcified pericardium. Pathological examination gave evidence which was very suggestive of tuberculosis as did the examination of the tissue removed at operation. (Figures 1 and 2.)

years. A diagnosis of adherent pericardium was made as the heart was fixed on fluoroscopic examination, and a Talma operation was performed. He died a few days later. Autopsy showed a normal heart and an almost completely adherent pericardium with adhesions to the pleura and diaphragm and constriction of the upper part of the inferior vena cava. There was also probable tuberculous pleuritis and perihepatitis. The liver weighed 1700 grams, the capsule was thickened and on the top in the region of the inferior vena cava there were massive adhesions.

FIGURE 1. Roentgenogram of a woman 32 years old with chronic calcified constricting mediastinopericarditis. The rim of calcified tissue encasing the left border of the heart is obvious.

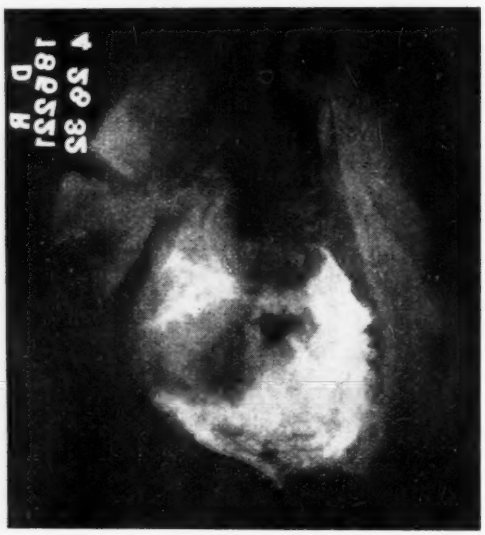

FIGURE 2. Postmortem roentgenogram of heart and lungs of the same patient as Figure 1 showing the complete calcification of the pericardium surrounding both ventricles. The clear area over the right ventricle is the region from which the pericardium was removed at operation.

These three cases of Pick's syndrome are clearly related to constrictive pericarditis or mediastinopericarditis. The pathology is consistent with tuberculosis.

In the recent review by Sprague and White of five cases of constricting pericarditis operated on at the Massachusetts General Hospital for relief of adhesions, it was shown that three cases were probably tuberculous in origin, one was found to have a probable subacute rheumatic pancarditis and one had no clear origin although there was a family history of tuberculosis.

A critical survey of the cases discharged from the wards of the Massachusetts General Hospital from 1896 to 1931 showed in addition to the cases mentioned from 1923 to 1930, that only one other case without a rheumatic history or evidence of rheumatic heart disease could be considered suggestive of Pick's disease. This occurred in a boy of 15 years of age who had a history of only four months of ascites apparently related to a "typhoid-pneumonia" and empyema with drainage a year before. This was not confirmed as autopsy was not secured.

One other group should be noted and that consists of four cases autopsied prior to the series which we are reporting that had no chronic ascites and no rheumatic history or valvulitis but showed marked pericardial synechiae, and in three an additional mediastinitis.

In one, a man of 40, a pleurisy with effusion 18 years before suggests that tuberculosis was the etiology. In another, a man of 33, a history of chronic otitis media and erythema nodosum also indicates a possible tuberculous origin. The two others were more obscure; one occurred in a young woman dying of uremic coma a few months after delivery. She gave a story of weakness, pain in the chest and vague joint complaints. Pleural and pericardial cavities were obliterated and the sternum was bound down by adhesions. Chronic tuberculosis of a bronchial gland was found. The final case was that of a man of 49 who was well until one month before entrance to the hospital when a "boil" on the buttock was incised. Fever, aching joints and purpura followed and at autopsy the pericardium was almost obliterated but contained a little serofibrinous exudate. There were adhesions to pleura and diaphragm and obsolete tuberculosis of a bronchial lymph node.

The respective weights of heart and pericardium in these four cases were 425, 403, 377 and 500 grams.

DISCUSSION

Results of Operation

Within the limitations of an autopsy study from a hospital treating mainly patients with acute disease it would seem justifiable to conclude that in over 35 years at the Massachusetts General Hospital only three cases of chronic constrictive mediastinopericarditis have come to necropsy that might have been helped by surgical resection of the pericardium and those are the three with chronic ascites.

During the period in which these patients were in the hospital, 1893 to 1920, there was at

intervals an attempt to give relief by means of surgery to cases diagnosed adherent pericardium, but the only direct operation performed at the Massachusetts General Hospital was the Brauer cardiolysis or removal of of ribs and cartilages overlying the heart to free adhesions to the chest wall. From 1908 to 1914 five such operations were done and the results seemed to justify a pessimistic evaluation of the method, but a survey of them shows that the fault lay largely in the indications for operation as dependent upon diagnosis. At operation in two cases no abnormality of the pericardium was discovered, and in two others there were no extrapericardial adhesions and the pericardium itself was not described. In the other case, the only one in which the pericardium was opened, an extrapericardial adhesion was found posteriorly at the apex and the two layers of the pericardium were everywhere adherent. No attempt was made to divide the adhesions.

Three patients survived the operation, but were not relieved of symptoms.

In the same period two patients with chronic ascites and thought to have constricting pericarditis but no valvular disease had Talma operations performed. One died (the case proved in 1920 at autopsy to have Pick's disease), and one apparently was somewhat helped and lived for four years. Another case of ascites was first thought to have tuberculous peritonitis but the peritoneum was normal at laparotomy. There was improvement, however, for three years. The patient then returned and the abdomen was tapped with relief lasting while he was in the hospital. Finally, a child of 8 years had a saphenoperitoneal anastomosis for ascites of one month in duration, without improvement.

The Brauer operation has not been reinstated at the Massachusetts General Hospital although reports in the literature suggest that it has a place in decompression of enlarged hearts with or without thoracic adhesions. The recent work of Churchill has created more interest and hope in the results of pericardial resection as suggested by Delorme and reported first by Rehn. In this operation the decortication of the heart is performed whether it is constricted by visceral or parietal pericardial scar. These results have been summarized by Sprague and White.

Etiology

This hospital is situated in an area where rheumatism is prevalent and it should be possible to form some conclusion about the probable responbility of rheumatism for Pick's disease. Our figures indicate that rheumatic infection is rarely if ever the cause. We have not observed recurrent ascites clinically in which rheumatic mediastinopericarditis was a likely cause with the heart small and free from gross valvular defect. Cases have been reported in childhood in which recurrent ascites with constrictive pericarditis due to rheumatic infection has been present without valvular disease as in the two cases of Osler (1896) but the hearts in these cases were enormous and death obviously occurred in one of these during a subacute rheumatism with subcutaneous nodules, although the child had been in bed in the hospital almost continuously for three and one-half years and the abdomen had been tapped one hundred and twenty-one times.

Recent evidence as to the gravity of pericarditis in rheumatism has been presented by Holt who studied fifty-one cases, thirty-nine of which had a definite history of pericarditis. Twenty-one had died and there had been five autopsies. In all but two patients (of the entire series) who had been "lost" so far as follow-up study was concerned, a clinical diagnosis of valvular disease was made. Valvular disease was present in all of the autopsied cases. In twenty-six cases acute pericarditis was the turning point in the disease and only one of this group was known to be alive three years after the attack. Twelve of the patients who died had ascites and enlarged liver but only two required tapping. In only one case did it seem out of proportion to other signs of heart failure. She points out that ascites in rheumatic children is a very bad sign as distinguished from the ascites of Pick's disease; such children have large hearts and valvular disease.

Our autopsy experience confirms this view. So far as we can discover, from 1896 to 1931 at the Massachusetts General Hospital only six cases of adherent pericardium and a history of rheumatic infection have failed at autopsy to reveal also rheumatic valvular disease and in none of these six cases was Pick's syndrome present. One other case not studied at autopsy had one year before entrance to the hospital, at the age of 33, an attack of polyarthritis followed by ascites. There was cardiac enlargement but no demonstrable valvular disease.

The six cases mentioned in the paragraph above deserve some note since they represent the only direct evidence we possess of the occurrence of rheumatic pericarditis with adhesions without valvular disease except for a case with this combination recently autopsied at the House of the Good Samaritan in Boston.

(1) A man (1896), 26 years old. He had three attacks of rheumatic fever eight, six and four years before. Fluid was removed from the pleura at the time of the last attack. For five weeks he had had shooting pain in the chest and abdomen with some joint pain. Heart sounds were very poor and a precordial rub was heard. At autopsy the heart was enormous and weighed 1328 grams. Slight verrucose vegetations were found on otherwise undeformed valves. The pericardium was completely adherent and attached to the diaphragm and pleurae.

(2) Boy (1900), 15 years old. Rheumatism began five months before and progressed to congestive failure, ascites and death. The heart was large. The pericardium was completely adherent by a loose vascularized reticulum. The valves were normal.

(3) Girl (1902), 11 years old. (Case mentioned in series of W. H. Smith.) She had had rheumatism four years before and five months before admission had swelling and pain of all her joints followed by congestive failure which increased. The heart was enlarged and there was a loud blowing apical systolic murmur, but at autopsy the valves were not deformed or thickened. The pericardial cavity was obliterated by old adhesions and the heart was large.

(4) Woman (1905), 55 years old. She had had rheumatic fever at 15 years of age. For ten years there had been variable edema of the legs and abdominal swelling for six months. Auricular fibrillation was probably present at the time of death. At necropsy a band of adhesion was attached to the left ventricle, and the pericardium and pleurae were adherent. Arteriosclerosis of the aorta, fatty infiltration of the myocardium of the right ventricle and thrombosis of the left innominate vein were present. The valves were undamaged. The heart weighed 450 grams.

Cases 5 and 6. These cases were reported in our series above—two men aged 21 and 56—with a story of rheumatism, adherent pericardium and no valvular disease. See the 2 cases starred in Table 1.

These six cases show that silent pericardial adhesions of rheumatic origin occur in rare instances in adult life and in most instances at least play no part in cardiac failure. In younger people (Cases 1, 2, and 3) the pericardial involvement is usually part of an active or subacute rheumatism and attended with cardiac enlargement from rheumatic myocardial disease.

We have observed a few children with acute rheumatic pericarditis who have completely recovered and show no definite evidence of valvulitis. This group will be important to follow in relation to delayed signs of pericardial adhesions.

An uncompleted follow-up study by Dr. T. D. Jones and Dr. E. F. Bland of one thousand cases of rheumatic infection seen in the past ten years at the House of the Good Samaritan in Boston has furnished us with a series of 62 cases of definite acute rheumatic pericarditis. (Table 2.) Thirty-seven are dead and in 28 of these the pericarditis was a part of a severe terminal infection. There were six autopsies. Of those who survived the acute infection but died later the average length of life was 3.3 years. Twenty-five cases are still living—ten in good condition after a period of 6.5 years; five are in fair condition; eight are in poor condition; and two have not been seen since leaving the hospital. In all but two living cases valvular disease is present and the heart is enlarged. One of these two exceptions is a boy of 17 years of age who had severe rheumatic fever with congestive failure and pericarditis ten years ago and now has no murmurs diagnostic of valvular disease and an apparently normal-sized heart. The other is a boy who had two attacks of rheumatic fever and acute pericarditis nine years ago. No cardiac disease is now demonstrable. One other autopsied case showed pericardial adhesion but no valvular disease. *In none of the 62 cases has Pick's syndrome developed in spite of practically certain pericardial adhesions.*

TABLE 2

FOLLOW-UP STUDY OF SIXTY-TWO CASES OF ACUTE RHEUMATIC PERICARDITIS FROM THE HOUSE OF THE GOOD SAMARITAN, BOSTON

	Valvular Involvement				
	Mitral alone	Aortic alone	Combined	No evident valvular disease	Total
Total	23	1	35	3	62
Living	7	1	13	2	23
Dead	15		21	1	37
Not followed	1		1		2

So far as chronic symptomless pericardial adhesion of old age is concerned, it need not concern us from the standpoint of therapy and its etiology is unsolved. It stands as a landmark of either defeated infection of unknown and probably variable type or as evidence of healing over minor myocardial infarctions. It apparently is no more significant than areas of chronic pleuritis.

The greater problem still remains, namely, the rôle of tuberculosis. The probability of this cause in the three proved cases of Pick's syndrome here reported suggests strongly to us that tuberculosis is the usual, if not the universal cause. It is usually secondary to tuberculosis elsewhere. Clarke recently could collect from his experience and the literature only thirteen cases of primary tuberculous pericarditis. The point about clinically proved tuberculous pericarditis, however, is that it is so virulent a manifestation of the disease that the patient usually dies. Of five proved cases at the Massachusetts General Hospital since 1921, four are dead and one still alive one year after pericardial resection. In other words, it is very difficult to trace the history of Pick's disease from an acute to a healed stage with the delayed appearance of signs of constrictive mediastinopericarditis. Tuberculous pleurisy and peritonitis may go through this evolution of healing and so rarely may pericarditis. The crucial study involves watching it in one individual, as has been done following drainage of the pericardium for sepsis as in a case reported in a discussion by Danach.

As Broadbent pointed out in 1898 the key to the solution of adherent pericardium lies in watching cases of acute pericarditis as they go

on to the formation of adhesions. Recent animal experimentation in this field has helped to complete the history of the Pick syndrome, as for example, the demonstration by Beck of the production of mediastinopericarditis followed by pleural effusion, edema and ascites, in the dog, by the injection of Dakin's solution into the pericardial sac. One other point of importance appeared in this work of Beck and that was the occurrence of fibrinous deposit between the lobes of the liver secondary to the pericardial inflammation without reference to any intra-abdominal manipulation, suggesting that perihepatitis may be secondary to pericardial disease and not an expression of so-called polyserositis. Polyserositis must not be confused with Pick's disease, however, as the former is a primary inflammatory reaction in serous cavities.

Such a clear sequence of events, however, seems not to be the usual history in chronic mediastinopericarditis. Its onset is insidious. Rheumatic pericardial involvement is acute and attended with enlargement of the heart, valvular disease and usually death coming within a very few years. Tuberculosis of the pericardium as clinically proved is usually fatal. Sepsis of the pericardium is very serious, pericardiotomy for it has a high mortality and in our experience purulent pericarditis has never resulted in delayed Pick's disease. Unfortunately for the suggestion of Broadbent in the study of this syndrome, the progression is rarely from the acute to the chronic pericardial disease but the onset more commonly remains obscure*.

SUMMARY AND CONCLUSIONS

A study of 1900 autopsied cases at the Massachusetts General Hospital from 1921 to 1931 in relation to pericardial adhesion is here presented with special reference to Pick's disease (chronic constricting mediastinopericarditis). This was undertaken for an analysis of the possible opportunities for surgical relief of the condition as related to various etiologic factors.

A survey of the autopsy material at this hospital from 1893 to 1931 as regards the incidence of Pick's disease reveals only three cases discovered at necropsy during this period.

In 35 years in 6100 autopsies only six cases of adherent pericardium with a rheumatic history came to autopsy in which valvular disease was not present. None of these cases had Pick's disease.

Tuberculosis of an insidious type is the most probable cause of the constricting pericarditis of Pick.

Adhesive pericarditis in middle and old age, even when calcified, in the absence of valvular disease is an unimportant cause of symptoms and is very rarely a contributory cause of death.

It appears unjustifiable to recommend pericardial resection following acute rheumatic pericarditis to prevent the later effects of pericardial symphysis, since valvular disease is practically always present and the prognosis following acute rheumatic pericarditis is usually bad, except for rare cases without proved valvular deformity in which we have never seen Pick's syndrome develop.

*The inflammatory polyserositis which occurred in some patients during the influenza epidemic of 1918-19 may possibly have been responsible for the later development of constricting pericarditis in a few cases. It was suspected as a cause in one of our cases.

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THE DOG'S GIFT TO THE RELIEF OF SUFFERING*

Prepared by Walter B. Cannon, M.D.† and Cecil K. Drinker, M.D.†

FOREWORD

YEAR by year bills are introduced into State legislatures designed to prohibit the use of animals in scientific experiments. Year after year, physicians, members of university faculties, and enlightened laymen, who realize that the public welfare would be vitally damaged in case such bills were passed, must exert themselves to justify animal experimentation before legislative committees.

In recent times the antivivisectionists have concentrated their efforts upon attempts to prohibit experiments on dogs. This activity, recognizing as it does the age-long friendship of dog and man, capitalizes sentiment more effectively

*This paper is a revision of an article published in *Hygeia* in 1926, by Dr. Walter B. Cannon, a revision made necessary by the important advances in the conquest of disease achieved by use of the dog since that date, and has the hearty approval and endorsement of the Committee on State and National Legislation of the Massachusetts Medical Society.

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than would efforts to prevent experimentation on all animals. Antivivisectionists are frank in declaring their hope that through legislation to prevent experiments upon dogs a beginning may be made in the prohibition of all animal experimentation. Such an attitude ignores the fact that experimental observations upon the dog have been more useful in relieving human suffering than those upon any other animal and, further, that dogs in general have benefited profoundly from experiments upon a small number of the group.

There are still many maladies from which people and animals suffer and die, because knowledge is lacking that would enable physicians to cope with them. Voters and legislators must decide whether experiments for the understanding and cure of these diseases — experiments justified not only by common-sense reasoning but by past achievements—are to be hampered or even prevented by sentimental protestations. In modern scientific laboratories, experiments upon dogs and other animals are conducted with far greater consideration than is shown to animals of the street and field, and under a supervision which assures that they are done wisely as well as humanely. Citizens should keep informed upon the meaning, the methods, and the results of medical investigation—a field of endeavor which profoundly affects our welfare, indeed our very existence.

THE DOG'S GIFT TO THE RELIEF OF SUFFERING

When an automobile lacks power, runs irregularly, or makes strange noises, the owner, if he be wise, takes the machine to an expert. The expert knows the uses of each part, the signs of its disorder, and the way to remedy the trouble. He has learned this by observing how the machinery works and how its action becomes disturbed. Conditions are similar for the human machine. Experts in knowledge of the human body have, however, little opportunity to watch its activities directly. Instead they must study the bodies of lower animals. In examining the workings and the disorders or diseases of the various organs, investigators have employed many lower animals—rats, mice, guinea-pigs, rabbits, cats, dogs, and monkeys. Some antivivisectionists affirm that even when an animal is anesthetized, man has no right to look into its body in order to learn how the parts act. There are others who say they do not object to experimenting on most animals, but they would spare the dog.

Dogs are indispensable for certain types of experiment. They will eat both animal and vegetable food and thus, more than any other available animal, live upon the same diet as man. They are large enough to permit surgical experiments under the structural conditions found in man, and live comfortably in surroundings necessary for most scientific observation.

THE DOG AND OUR KNOWLEDGE OF DISTURBANCES OF THE CIRCULATION, OF BREATHING, AND OF DIGESTION

The marvelous growth of modern medical science began about 300 years ago with Harvey's discovery of the circulation of the blood. Among the animals in which he studied the visible motions of the heart was the dog. Since Harvey's time the dog has served in many investigations of the disorders of heart action, thus furnishing information used daily by physicians in treating heart disease in man. Sir Thomas Lewis, perhaps the foremost living authority on this subject, testifies that the painless sacrifice of a relatively small number of dogs has yielded a "wealth of knowledge which so long as medical science exists will continue to confer great and lasting benefits on mankind."

As men and women pass into the later years of life, they are likely to have an increasingly high blood pressure. It may even become dangerously high. When this condition is found suitable hygiene must be instituted to prevent catastrophe. The common method now in use of determining blood pressure in man was proved accurate by tests on dogs. Whenever a physician applies the simple cuff to the arm, he and his patient should remember their debt to the dog.

The so-called "prone-pressure" method of resuscitation is used in civilized countries all over the world as a means of giving artificial respiration to revive persons apparently drowned, the victims of electric shock, and the unfortunates overwhelmed by noxious gases. This method was devised by Schäfer, Professor of Physiology at Edinburgh University. It was first proved efficacious by tests on a few dogs which were successfully revived. Dogs were selected rather than other animals because they alone had chest walls nearly enough like man's in elasticity to serve the purpose. The prone-pressure method of resuscitation has already been the means of saving innumerable human lives and it will continue its beneficent service.

Vital facts about the work of the digestive glands and the course of digestion of different foods in the stomach and intestines have been learned by experiments on dogs. In 1904, Pavlov, the noted Russian physiologist who carried on these studies, was given the Nobel prize in medicine for his many new contributions to our knowledge of digestion. Since successful treatment of digestive disorders depends greatly upon a clear understanding of normal conditions, Pavlov's discoveries are in daily use by physicians.

The well-known children's disease, rickets, had long been a mystery and the rational treatment of it awaited explanation. By feeding experiments on puppies the cause of this disease was

found to be the lack of an essential food factor commonly present in animal fats. The way to prevent or cure the disorder was at once obvious and today sufferers from rickets can be cared for successfully. Rickets is one of many

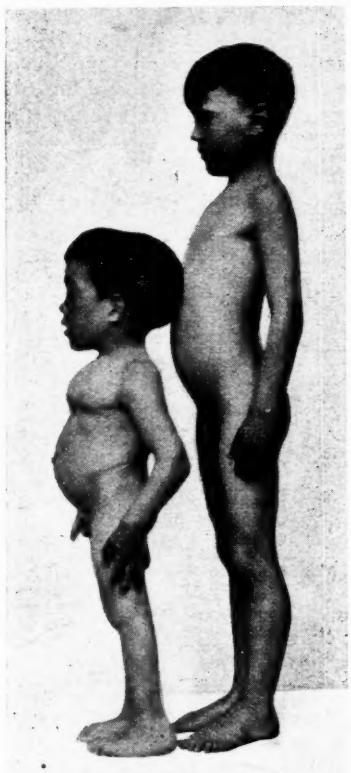

FIG. 1. Each of these boys is seven years old. Both have rickets. Today, through dietary experiments on puppies, we know how such deformity can be prevented.

diseases affecting both man and animals. Veterinarians and dog breeders make use of the same dietary measures as are employed in our hospitals for children.

THE DOG IN RELATION TO SURGICAL PROGRESS

In no realm has progress been more rapid or more serviceable to mankind than in surgical technic. When a new operation must be tried it may be attended by great risk. Shall the risk be taken by the sick man or woman, or by a lower animal? Small animals are too tiny for surgical operations, therefore the size of the experimental animal is important, and many operations now performed daily on man were first tried on the dog. Harvey Cushing, the renowned brain surgeon, has testified that knowledge of ways to operate on the pituitary gland—a small body at the base of the brain—was derived from a series of surgical experiments on dogs and that every patient operated on for pituitary disease, and thereby possibly saved from a life of blindness, may thank the dog for this blessing. Furthermore, the amount of kidney substance as well as the amount of the small bowel that can be safely removed—questions made important by accident and disease—was first learned by surgical tests on dogs. The dog helped in discovering methods of uniting the ends of the cut bowel, and of uniting the stomach with the bowel by way of a new opening. By experience with the dog, surgeons have learned to operate on the chest. Operations on the heart, even on the interior of the heart, were first perfected on the dog and later done effectively on human beings. A recent line of surgical progress has been concerned with the relief of the very dreadful pain of that form of heart disease called angina pectoris. Through experiments upon dogs the nerves leading from the heart, and responsible for heart pain, were located and the fact determined that these nerves might be cut without disturbing the action of the heart. Sufferers from angina, who formerly had but transient relief through large doses of drugs, may now be cared for surgically—a result entirely due to experiments upon dogs.

THE DOG AND THE TREATMENT OF DIABETES

Another grave condition afflicting mankind is diabetes, a disease characterized by defective utilization of starchy food. In 1889 experiments showed that dogs developed diabetes if the pancreas was removed. Attempts were at once made to treat the disease by feeding pancreas, but it was not until 1922 that Banting and Best in Canada succeeded in making an extract of dog pancreas which could be given to patients and which controlled the disease. This extract

FIG. 2. When Richard developed diabetes in 1925 his mother worried just as the mother dog in this picture, but insulin had come and she did not have to be told he would die within a year.

is called insulin. Today insulin is made of beef pancreas. Dr. Elliott P. Joslin, the distinguished American authority on the treatment of diabetes, says of the discovery of Banting and Best, "Insulin revolutionized the treatment of the diabetic. Before insulin was discovered the

average patient literally suffered from hunger and thirst and was without hope because he could not find another diabetic who was living comfortably five years longer than himself. The parents of a diabetic child were panic-stricken and doctors broken-hearted when they learned a child had the disease. One of the most noted children's specialists in the United States wished

FIG. 3. George developed diabetes when 5 years old. Bob soon became his companion and the picture was taken 3 years later. George is now a fine young man.

he might never have another diabetic child to treat; so sad was it to see a child starve to death. The average duration of the life of diabetic children was surely less than a year, and that of the largest group of diabetic children in the world under careful observation was less than two years." Today all this is changed. Prior to the discovery of insulin, through experiments on a small number of dogs, no such pictures of diabetic children as those which illustrate this article existed. A short period of miserable invalidism was followed by death. Dr. Joslin writes again, "Thirty years ago when I began treating diabetic children I counted the days they lived. It is hard to believe, but it is true, that now I am beginning to measure their lives in decades of years."

It has been estimated that in the United States alone there are now 1,000,000 people who already have diabetes or will develop it. To this vast horde, knowledge gained by experiments upon the dog gives comfort, hope, and useful lives. If the dog had aided us in no other struggle against disease, we could never repay him for the ammunition he has given us in the fight against diabetes.

THE DOG AND THE TREATMENT OF PERNICIOUS ANEMIA

A few years ago pernicious anemia was one of the most distressing diseases with which man was afflicted. It usually affected adults in good health, and, while it required a long time to kill, it invariably did so. Today the patient with pernicious anemia can continue to live usefully and contentedly.

Experiments upon rats and other animals

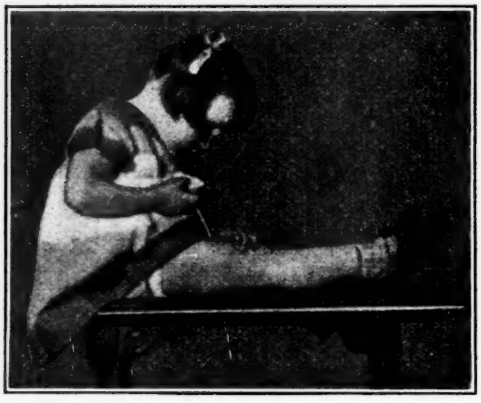

FIG. 4. Betty, age 2 years and 11 months, injecting her own insulin. Many diabetic children do this every day.

had shown that a diet rich in liver promoted growth in an unusual way. Physicians had thought that in pernicious anemia the patient needed something to promote formation of the blood, but no one had an idea of the nature of the necessary substance. Dr. Whipple and his associates in the University of California undertook the systematic study of the blood under various conditions in dogs rendered anemic by bleeding. In 1922 they found that such dogs, if fed a diet rich in liver, restored the lost blood more quickly than if given any other food. With this knowledge, gained by experiments upon the dog, two practising physicians in Boston, Dr. Minot and Dr. Murphy, who had long struggled over the terribly distressing task of attempting to prevent patients with pernicious anemia from dying, began to feed such patients with liver. The results were almost miraculous. Pernicious anemia treated with liver was not a fatal disease. The liver supplied something by means of which these unfortunate people could manufacture blood. In the beginning, patients had to eat raw liver. Then various means of concentration were found possible. Today small capsules containing liver extract are furnished the patient. This extract, when taken daily, controls the disease and allows a wholly normal life.

It is an interesting fact that about one year before the discovery of insulin Dr. Minot, the

principal in the discovery of the liver treatment of pernicious anemia, found that he had diabetes. When insulin became available he was treated with this substance. Experiments upon the dog, resulting in the discovery of insulin, in this way saved the man who, later, taking advantage of other experiments upon the dog, developed a method for controlling another formerly fatal disease, pernicious anemia.

THE DOG AND THE TESTING OF DRUGS AND PROTECTIVE APPLIANCES

Still another way in which the dog is helpful to mankind is in the proving of drugs. The strength of some of the most important medicinal agents can be learned only by being tested upon animals. For example, the United States Government requires that the drug epinephrin, also called "adrenalin", must be standardized by injection into dogs. This drug is used universally to check bleeding and to abolish the acute distress of asthma. Cannabis indica, an important sedative, must also be standardized by canine tests. The dangers of many chemical substances in common use have been discovered by experiments on dogs. In this way wood alcohol was first shown to be harmful and capable of causing blindness and death.

Dogs have been of indispensable value in reaching conclusions as to the amounts of dangerous gases, such as carbon monoxide, which can be permitted in the air of tunnels and mines, or in manufacturing processes. They have had an equally important part in the development of protective appliances worn in atmospheres containing poisonous gases, in diving, and in work in compressed air.

THE DOG AND THE TREATMENT OF DISEASE IN THE DOG

Not only have experiments upon the dog alleviated human suffering but they have been profoundly helpful to the dog himself. Two instances will illustrate the striking advances which have been made.

Hookworm in dogs. In 1915 there was no satisfactory treatment for hookworm disease of dogs — a disease widespread over the United States. It was so severe in parts of the South that it was impossible to raise dogs successfully. As a result of experiments on dogs, Dr. Hall of the Bureau of Animal Industry in Washington found that carbon tetrachloride is a satisfactory drug for removing the worms. Ascertaining the value of this drug involved the use of 30 dogs which had been condemned to death in the pound. These dogs were given doses of the drug and painlessly killed after four days. The value of the drug was judged in the only satisfactory way known at present, by collecting the hookworms passed after treatment and ascertaining whether any remained in the dogs' intestines. Since 1921 another and better drug for hookworm, tetrachlorethylene, has been discovered by work on the dog. This has been used with success by the veterinary profession not only upon innumerable dogs but upon cats, foxes and sheep.

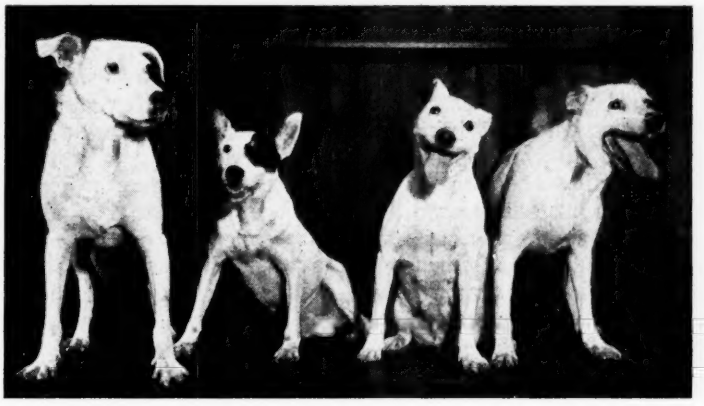

FIG. 5. Several dogs used in anemia experiments to demonstrate the potency of liver for blood regeneration after blood loss. It was a short step from the experiments on these dogs to the cure of pernicious anemia in man.

It is often a contention of antivivisectionists that dogs are so different from man that nothing of value can be learned through them. The result in the treatment of hookworm is one of the many instances which refute this statement. Carbon tetrachloride and tetrachlorethylene, discovered by experiments upon dogs to benefit dogs, are the drugs used today in treating hookworm in man. The good these drugs have done is evident in the bettered health of millions of human beings who otherwise would be ailing or incapacitated.

Distemper in dogs. Distemper is a highly infectious disease of dogs, attacking chiefly animals from a few weeks to a year old. It is widely disseminated throughout the world, and, in those countries where it has not become established, the introduction of an infected animal at once gives rise to a severe outbreak among exposed dogs. The mortality is invariably high; most authorities consider 50% to be a conservative figure.

It is hardly necessary to describe the picture of a puppy stricken with distemper; for who has not seen one or more aspects of this disease and who does not know the suffering it entails? If the puppy does not die—and, as we have said, 50% do—the disease often leaves its mark in the form of a severe nervous affliction, chorea, or a lingering paralysis. The disease is strictly an animal plague, however; man goes free of it. Why, then, did so many dog owners and dog lovers in the British Isles contribute generously during the years 1923-1928 to the "Field Distemper Council," which planned to carry on investigations to determine the cause, prevention and treatment of the disease? It was because these persons cherished dogs as friends and wished to save them from preventable illness and death. The subscribers were men, women, and children from all ranks of society. They gave knowing that their donations would be used to carry on animal experiments, to do vivisection, as it is invidiously termed, in the hope of discovering the cause, prevention and cure of distemper. They were willing that dogs should be used in the attempt to save more dogs; and their intelligent perception that the few could be used to rescue the many has been amply justified. As a result of the experimentation, the British scientists developed a vaccine for prevention of distemper and a serum for its effective treatment. The vaccine, the use of which is spreading in this country, prevents distemper in 99% of instances. Indeed it is conservatively estimated that in the United States alone many tens of thousands of puppies are saved each year by means of it.

THE GREAT WAR AGAINST PAIN

The medical profession is continuously engaged in a much greater war than the World War—a struggle against the needless pain, crippling, and premature death not of men alone but of animals too. The recent great victories over disease have been largely won by means of the knowledge gained through experiments upon animals. Man is better justified in enlisting the dog in the struggle against pain and disease than he has been in utilizing his aid in actual warfare, for the dog shares in the victories that are gained.

In the United States all institutions in which animals are used for medical and biological research have adopted regulations providing for the comfort and sanitary surroundings of the animals. All operations must be sanctioned by the laboratory director. He is held responsible for the importance of the problems studied and the propriety of the methods applied. Furthermore, the regulations require all operations likely to cause greater discomfort than anesthetization itself to be done under anesthesia and to be followed by painless death. Only the director can make exceptions to these provisions, and he can do so only in the cases in which anesthesia, or death of the animal, would defeat the purpose of the experiment.

The advances that have been described indicate that the dog has played an essential rôle in bringing relief from pain and freedom from many sorts of avoidable death. Yet men and animals still suffer and die because their maladies are not understood. The death-rate from cancer is high and this mysterious disease is even more common in dogs than in men. Recent work in England has shown that the means to cure cancer in man can be utilized for animals as well. The skin cancers of dogs yield to treatment with x-ray and radium. In this instance the means of cure was tested first on man because his need was the more pressing; but it has helped the dog too.

The loyalty, devotion, and self-sacrifice of the dog have often been emphasized. The instances that have been given prove that the sacrifices made by dogs have resulted in rich and manifold contributions to human and animal welfare. It is plain that much remains to be learned before both dogs and men shall be free of dreadful scourges which menace their health and existence. Because the dog has rendered to us and to his own kind such immeasurable benefits in the past, we turn to him now with assurance of further benefits. Of the dog used by the medical investigator, William James wrote with appreciative understanding: "If his poor, benighted mind could only be made to catch a glimpse of the human intention, all that is heroic in him would religiously acquiesce." We who know the beneficent results coming from these "intentions" should do homage to the dog through whom they come.

Pictures of diabetic children supplied by courtesy of Lea and Febiger, Publishers, Philadelphia.

THE USE OF EPHEDRA IN ASIATIC MEDICINE AND RITUALS*

BY SOMA WEISS, M.D.†

EPHEDRIN, an alkaloid with the empirical formula $C_{10}H_{15}ON$, has come to be widely used in medicine during the recent years as a circulatory stimulant, particularly in surgical shock, as a vasoconstrictor in spinal anesthesia, as a bronchodilator in asthma and as a pupillary dilator in ophthalmology. Its pharmacodynamic effect is somewhat similar to that of epinephrin, although there are some fundamental differences in their action. Both substances

*Based on an address before the Boston Medical History Club, Boston, Massachusetts, February 15, 1932.

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stimulate the sympathetic nervous system, but the sympathomimetic action of ephedrin is less specific and less intense.

Ephedrin, in contrast to epinephrin, is absorbed effectively from the gastro-intestinal tract and produces a more lasting elevation of the blood pressure. Ephedrin poisoning, similar to epinephrin, manifests itself in flush, excitement, tremor, sweating, palpitation, and epigastric discomfort.

Ephedrin was first isolated from the crude drug ephedra vulgaris helvetica in 1887 by the Japanese, Nagai[1]. He recommended its use in 10 per cent solution as a mydriatic, especially when atropin was contraindicated. For three decades after Nagai's report, ephedrin was used but rarely in Western medicine; but interest in its chemical composition was carried along, and finally it was successfully synthesized. Chen and Schmidt at the Peiping Union Medical School stimulated the present widespread use of ephedrin in medicine. These investigators studied a group of potent drugs suggested to them by a Chinese druggist, among which was Ma Huang, an old drug listed in the famous dispensatory and in the legendary book "Pentsao." Chen and Schmidt prepared a decoction of the crude drug and injected it into a narcotized dog left by a group of students after a physiological experiment. The prolonged rise produced in the blood pressure of the dog started the systematic pharmacologic study of ephedrin.

"Ma-Huang" has been identified as ephedra vulgaris s. helvetica, a member of the family gnetacea. The Chinese name "Ma" means "astringent" and "Huang," "yellow", which describes the taste and the color of the plant after storage. The botanical nomenclature of ephedra is somewhat contradictory. Various species of ephedra are found in China and Central Asia, and also in Europe, America and Northern Africa. The various species of the ephedra of Asia occur throughout the Himalayas, in India, in Central Asia, particularly Afghanistan and Persia. The American and European ephedra contains none or only a slight trace of the potent alkaloid, ephedrin.

The plant "ma huang" of ephedra vulgaris is a low, leafless shrub about 60 to 90 cm. high which blossoms in the summer. The stem is slender, somewhat ribbed and channeled, and green in color. It is about 1.5 mm. in diameter and terminates in a sharp point. There are nodes on the stem about 4-6 centimeters apart. Branching occasionally takes place at one of these nodes.

The dried, short brownish sticks sold today in the native Chinese drug stores are the same ephedra that was first tested by the Emperor Shen Nung some 5100 years ago. This emperor, "the father of Chinese agriculture", who lived from 3217 to 3077 B. C., tested numerous plants. It is claimed that he wrote the "Pentsao" which describes 360 drugs divided into "superior", "medium" and "inferior" classes. Shen Nung classified ma huang as a drug of the "medium class". Since antiquity it has been known to produce sweating, reduce fever, stimulate the circulation and relieve cough. It was used in many famous prescriptions and was included in "Pentsao Kang Mu," the Chinese Dispensatory, in 1596 A. D. This dispensatory is a revision and enlargement of the original "Pentsao" and contains 1871 drugs classified into 62 orders and 16 classes, in 52 chapters.

That the use of ephedra in ancient times was not confined to medicine but was also extended to religious rituals was brought to my attention in 1930 by Sir Aurel Stein, the Central Asiatic explorer and archaeologist. He recently sent me, from the base of his present expedition, additional information which I believe is of sufficient interest to call to the attention of the medical profession.

In 1914 an archaeological expedition took Sir Aurel Stein back into those barren sections of innermost Asia which conceal so much of the past. There ruined forts and fragments of their equipment, abandoned to and preserved by the desert, bear witness to a civilization over a thousand years old which developed under the influence of Buddhist India, China and the Hellenized near East.

Nineteen miles from the ancient military station of Lou-Lan[2], the old Chinese castrum L. E. was discovered. This fortification dates back to the first military advance of the Chinese into the Tarim basin, in the last years of the second century B. C. According to Stein, "it had been constructed to serve as a point d'appui for Chinese missions and troops on their first reaching habitable ground in Lou-Lan territory after having crossed the dry, salt encrusted sea-bed and skirted its absolutely barren north shores. It thus represented, as it were, the bridge-head of the desert route by which the advance had been made, and which the Tun-Huang lines were intended to guard at its eastern end." The walls of the castrum were strong enough to withstand any attack by bands of the barbarian Huns.

In order to learn more about the inhabitants of this station, a cemetery outside of the wall was explored. Several of the graves proved to be in a surprising state of preservation. In one, a remarkably well preserved human body was found. According to Stein the head and face of this and of other bodies, suggested the Homo Alpinus type. The soldier probably belonged, therefore, to the semi-nomadic tribes of ancient Lou-Lan. The body was enveloped in a shroud of coarse canvas. Across the breast were two little bundles, tightly tied. One bundle contained grains of wheat; the other, a quantity of small broken twigs. These were provisions

for the hereafter. Stein says: "But it may be safely assumed that the provision of such small packets of twigs formed part of the regular funeral practice among the indigenous people who, in a more or less nomadic fashion, inhabited the Lop tract during the first few centuries of our era before it became a wholly waterless desert." Specimens of twigs from this grave were submitted to A. B. Rendle, Keeper of Botany of the British Museum, who in 1925 gave the following opinion: "The specimens (they are all the same) are undoubtedly fragments of the twigs of ephedra, a low growing shrub with slender green branches devoid of leaves except for a small membranous sheath at the nodes."

It is of interest that the sacred *Homa* or *Soma*, a plant used even today in the Zoroastrian ritual of the Parsis of India, has been identified as ephedra. Watt's Dictionary of the Economic Products of India contains the following statement: "Interest has recently been taken in these curious plants from the observation that the dried twigs of an ephedra imported from Persia into Bombay constitute the sacred homa of the Parsis. A sample of the homa obtained in Bombay was at first determined as periploca, aphylla, an erect leafless perennial with twigs as thick as a goose-quill, or less, and possessing a milky sap. Subsequent examination of other samples, however, revealed the fact that the homa of the Parsis was in reality an ephedra."

According to Stein[3], it is possible that the ephedra twigs were regarded by the ancient Lou-Lan people as a symbolic provision to prevent decay of their bodies and thus to assure their enjoyment of the future life. This belief is also supported by the statement in Watt's Dictionary: "The Parsi priests say that the homa never decays, and they always keep it for a considerable time before they use it." In addition Stein makes the following suggestion: "On general grounds it appears to me probable that this effective therapeutical use of a plant widely spread in Central Asia may have been practiced from early times in the region of the Tarim Basin. If to this is added the evident ease with which the dry twigs of ephedra can be preserved for such use, their provision in those ancient burial deposits of the Lop tract can well be accounted for."

It is more difficult to explain, according to Stein[3], how the ephedra plant came to be used for the juice which, even in the Zoroastrian rituals of the present day, is representative of the ancient *Haoma* or *Soma*, described in the Sanskrit. Soma, according to A. A. MacDonnell (*Vedic Mythology*, Strassburg, 1897) was the Indian Bacchus, one of the most important Vedic Gods. The true home of the Soma plant was Heaven, and its juice was drunk by the gods as well as by man; under its influence Indra created the Universe. The preparation of the ritualistic juice, therefore, was a sacred ceremony. In both the Rig Veda and Zend Avesta the Soma is described as a medicine which gives health, long life and abolishes death. It is certain that the Haoma of the Avesta is identical with the original Soma plant of the Vedic hymns. The exact nature of this original plant is not known. The ancient hymns say that it grew on the mountains and along certain rivers; but the geographical and floral character of this area has undergone such extensive changes that these references help but little. These very changes, as a matter of fact, may have forced the priests to change the sacred plant from time to time. It is probable, however, that the acceptance of ephedra as the ancient Haoma is not recent. Stein points out that along the border tracts of Persia and Afghanistan the popular name of ephedra is *Hum*.

Stein and other orientalists have been considerably puzzled as to how to reconcile the character of the juice obtained from this hum or ephedra plant, extremely bitter and far from palatable even as a medicine, and the exhilarating and exciting effects of both the soma and haoma described in the Rig Veda hymns and in the Avesta, with any one plant natural to those regions. Our modern pharmacologic knowledge may help in solving this riddle of the soma. The pharmacologic properties of the wild rhubarb and other plants which have been suggested as the original soma plant are not compatible with the excitement and exhilaration observed during the rituals, unless a fermented, intoxicating fluid was prepared. No indication of such a process is found in the manuscripts. The sympathomimetic action of the ephedrin alkaloids is, on the other hand, entirely compatible with such an effect. Ephedra is compatible with both ritualistic and medical practice, and this dual use of the soma is emphasized in the ancient literature. It is questionable whether the bitter taste of the ephedra juice should be considered a valid argument against considering it the pleasing drug described in the Vedic hymns. It seems probable that in the fanatic, emotional excitation produced by religious suggestion, any unpleasant taste might be overlooked. Again, poetic license would be particularly justifiable in describing a sacred drug. Furthermore, the bitter taste may easily have been counteracted through special preparation. Thus modern knowledge rather favors the identification of ephedra with the sacred Soma or Haoma.

The world has changed since the Vedic hymns were written in praise of the sacred Soma. Ephedra is no longer gathered to accompany the faithful on their eternal journey. Today the crude drug is shipped in bales from China in

amounts approximating 1,000,000 pounds a year[4]. The demands of modern science have made the ancient Ma Huang, the Hum, the sacred plant of Soma, a commercial product, shipped to hospital and dispensary all over the world, and so have created a new industry for a modern China.

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RABIES VACCINE ENCEPHALOMYELITIS

Case Reports

BY JOSEPH TARTAKOFF, M.D.,* AND FOSTER L. VIBBER, M.D.*

DURING the past two years there have come to the attention of the authors two cases of untoward central nervous system reaction to antirabic treatment. In both instances the preparation used was the Semple "phenol" modification of the original Pasteur formula, and the products were obtained from the same pharmaceutical house.

Numerous similar case reports have appeared in the recent literature, but the authors feel that this paper is justified since the clinical entity of rabies vaccine encephalomyelitis has not become common knowledge. Most courses of antirabic treatment are administered with little appreciation of possible ill-effects, or of precautions that may lower the incidence of paralytic accidents.

The first case is that of G. P., a healthy adult male of 25 years, who three weeks before admission received upon his hand the saliva of a dog which had bitten a man. A total of seven persons, three adults and four small children, were exposed to the dog by bite or saliva, and, a positive microscopic diagnosis having been rendered by the State Department of Public Health, all received antirabic treatment. Of the seven receiving treatment, only our patient developed neurologic complications.

While occupied as a farm-hand and during the performance of laborious work, he received fourteen injections into the upper arms. Following the tenth injection into the left arm, there appeared within a day wristdrop of that member and in the following several days subjective stiffness and paresis of the left leg. Examination at the time of admission, two weeks after the onset of symptoms, revealed the left wristdrop, paresis of the left leg, absent abdominal reflexes, hyperactive deep reflexes and general hypesthesia below the mid-dorsal region. Lumbar puncture done upon admission revealed normal pressure and dynamics; examination of the spinal fluid revealed negative gold sol and Wassermann, slightly increased globulin, and twelve lymphocytes and four red blood cells. Routine laboratory studies including serology were negative, and the clinical chart remained within normal limits at all times.

The partial sensory loss which never reached above D6 gradually fell and was replaced by marked hyperesthesia of the trunk and lower extremities. On several examinations there was slight weakness and hypesthesia of the right arm, but these findings promptly disappeared.

The patient was discharged on the thirty-second day of his illness showing complete recovery of motor and sensory function of the lower extremities and trunk but a residual left radial palsy. At the present writing the patient complains only of weakness of the left forearm.

The second case, W. L., a 34 year old white male, exposed himself 19 days before admission by extracting a tooth from a cow subsequently proved to be rabid by microscopic examination of the brain. Routine treatment was started five days after exposure. Twelve injections were given at daily intervals and the patient continued to do heavy work as a farm-hand and bus-driver. After the eighth dose he believes that he caught "cold", complaining of fever, constipation, vomiting and slight pains in the legs. These symptoms were quickly followed by urinary retention, inability to walk, and subjective numbness involving the legs and abdomen and leading to hospital entry. On admission there was complete motor and sensory loss below the level of D6, and within twelve hours the level had reached C4. At this time the patient experienced considerable respiratory difficulty and he was placed in the Drinker respirator with complete relief. The temperature was then 100°, pulse 80, W. B. C. 10,700. Spinal fluid pressure was 120 mm., dynamics normal, Wassermann negative, gold sol 4443221100, total protein 100. There were 53 lymphocytes and 2 polynuclears per c.mm. of fluid.

The patient remained in the respirator intermittently for several weeks with gradual progressive improvement of neurologic signs. Complete urinary retention persisted, however, and repeated catheterization was followed by an obstinate urinary infection. During the height of the symptoms there appeared recurrent crops of generalized urticarial lesions responding readily to treatment. At the time of discharge, 55 days after the onset of symptoms, the patient remained bedridden, but had regained some motor function of the lower extremities and practically complete sensory function. Since discharge, improvement had continued, so that at present the patient has good bladder control and is able to walk unaided.

The first case is one of dorsolumbar myelitis which is the most common type in the classification of Bassoe and Grinker[1]. This classification includes an acute ascending myelitis of the Landry type and neuritic forms in addition to the above form. The element of personal idiosyncrasy is well demonstrated since, of seven persons receiving injections of the same preparation under similar circumstances, only one developed any unexpected symptoms. Stuart and Krikorian[2] state that the "actual occurrence . . . is governed by individual predis-

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position or idiosyncrasy, i.e., relative intolerance to foreign inocula."

The second case is a characteristically severe ascending myelitis of the Landry type escaping the medullary centers by a narrow margin. This type comprises 29% of rabies vaccine complications according to Skoblo[3]. The urticarial manifestations are of interest in light of the paper of Cornwall[4] who studied the local and general anaphylactic reactions to antirabic vaccination.

The relative infrequency of complications leads the practitioner to carry out antirabic treatment whenever the possibility of exposure to rabies exists, and rightly so in view of the tremendous mortality of the latter disease and the complete protection afforded by the prophylactic injections. However, cases of the nature cited above, and many reports of fatalities occurring during treatment should contraindicate its use where definite exposure to a rabid animal can be excluded.

It appears, according to the work of Stuart and Krikorian cited above, that the incidence of complications is smaller with the Semple and other phenol modifications than with the other Pasteur preparations, but that even these methods are not without danger. The above authors have demonstrated that the paralytic accident is a specific anaphylactic response to the cord substance which serves as the medium in which the rabies virus is suspended. It is to be expected that further refinement of the product with separation of the noxious cord substance offers the greatest promise of a vaccine free of dangerous potentialities.

Workers at the various Pasteur Institutes and others interested in the prophylaxis of rabies are agreed that overexertion during the course of the injections plays an important rôle in precipitating the neurological complications. It is recommended that the patient remain completely at rest during the course of treatment and that the injections be discontinued with the appearance of the first untoward sign or symptom.

The authors take this opportunity to express gratitude to Dr. E. L. Hunt for his aid, and to Dr. B. T. Burley, on whose service at the Worcester City Hospital the above cited cases were observed.

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MA100 NOW AVAILABLE

For the specific purpose of securing statistical data on its use, the National Tuberculosis Association has been privileged to make available to state and affiliated tuberculosis associations supplies of the new human tubercle bacillus protein MA100. This substance, which for all practical purposes may be looked upon as a tuberculin, is for use in testing groups of children and adults to ascertain the presence or absence of tuberculosis infection.

MA100 is one of the thirteen major end-products obtained from the chemical analysis of the tubercle bacillus being carried on under the direction of the Medical Research Committee of the National Tuberculosis Association. It was first isolated by Dr. Florence Seibert in 1928. The substance is a protein produced by growing human tubercle bacilli on Long's synthetic medium. This medium is protein-free and of fixed standard composition, so that it is always the same, conditions which cannot be met in other media on which tubercle bacilli have been grown since the days of Koch. Inasmuch as the medium is protein-free, all of the proteins found in the medium after the growth of tubercle bacilli on it must have been produced by the metabolic action of these bacilli. By precipitating the bacilli from the medium at an always fixed point, it is apparent that the protein thus produced is always the same, and of known standard quality. This precipitated protein has been designated as MA100. It is significant to note that in the researches of the Committee the same kind of substance has been found in each type of bacillus, human, bovine, avian, and timothy-grass.

The development of MA100 from a laboratory product as isolated by Dr. Seibert to a commercial product is due largely to the coöperation with the Medical Research Committee of the Sharp and Dohme Laboratories. MA100 is now obtainable through the usual channels by any physician or sanatorium.

The sale of MA100 by the National Tuberculosis Association is restricted to state and affiliated tuberculosis associations and for their use only in group testing of children and adults. It is sold in this way only in 5cc vials, sufficient for 100 doses each (Price $2.00). With each vial is furnished a printed circular of directions. The associations buying MA100 in this way must agree to furnish to the National Tuberculosis Association detailed statistical records on forms supplied free for this purpose. These forms, one for a group record and the other for individual records, must be filled out and returned to the National Tuberculosis Association for each group tested with MA100. This sale of MA100 for experimental use may be discontinued at the end of the year. It is hoped, however, that from the statistical records obtained in this way information may be gleaned that will be of service in determining more exactly the criteria for its use.

For further detailed information regarding MA100, the reader is referred to the following paper: "The Present Status of the Skin-reaction in Tuberculous and Non-tuberculous Subjects," E. S. Marriette and E. P. K. Fenger, *American Review of Tuberculosis*, March 1932, p. 357.—*Bulletin of the National Tuberculosis Association.*

MEDICAL PROGRESS

PROGRESS IN UROLOGY

BY FLETCHER H. COLBY, M.D.*

INTEREST in Urology during the past year has been focused upon the relieving of *prostatic obstruction by intraurethral methods.* The idea is not new. Bottini, Freudenberg, Young, Caulk, and many others devised instruments in the past with this in view, and other methods for the relief of obstructions of certain varieties have been successfully used for many years. Fibrous obstructions about the bladder outlet have been treated by such intraurethral methods in many instances, notably the Young punch and its modifications, without the necessity of open operation. There have been drawbacks, however, to all of these older methods, the chief of these being hemorrhage and the lack of vision, or the lack of adequate vision, in the performance of the necessary manipulations. The factor of hemorrhage was partially overcome by the substitution of a cautery blade in the punch, but too often cauterization simply served to postpone the bleeding to such time as when the slough came away, a week or more after operation. Vision was never particularly good with former instruments. With the introduction of high frequency currents into surgery, Stern, in 1926, devised an instrument for removing portions of the prostate by means of the diathermy current and a modified cystoscope called the "resectoscope". Again, however, hemorrhage was such a menace as a result of this procedure, that it found little favor. Further developments in the field of electro-magnetics, however, resulted in a greater selection of currents available for surgical work, currents of greater variation in voltage and amperage, and a better understanding of their principles as applied to surgery. Certain currents could be used for cutting tissue with a minimum of destruction while other types of current caused more marked necrosis by coagulation. Davis of South Carolina and McCarthy of New York took advantage of these facts in their modifications of the Stern resectoscope. The Davis and McCarthy instruments are those most commonly in use today. Both depend on a loop of wire passed through a cystoscope to remove piece by piece, obstructing portions of the prostate with the diathermy current. These instruments are very cleverly constructed and exceedingly efficient in operation. With them the operation is performed under adequate vision and in most instances, bleeding can be controlled successfully.

Any method which will effectively relieve the unfortunate sufferer from prostatic disease without subjecting him to a major operation must have a wide appeal. Prostatic resection as a substitute for prostatectomy has been given wide publicity accompanied by the usual flood of literature from instrument makers and ardent advocates. It is already apparent that this method constitutes an advance in the treatment of the diseased prostate but it is yet too early to give the method its proper evaluation and to know when its use is best indicated. It is reported that Davis has performed the operation in nearly 400 cases without a fatality and with no serious complications.[1] In a series of over 200 cases reported by Davis[2] the results are surprising and certain features of his report are worth repeating:—

> "There was no death following operation in over 200 cases.
>
> "Epididymitis occurred in six cases; less than three per cent.
>
> "Suprapubic cystotomy for hemorrhage was necessary in but one case.
>
> "One secondary hemorrhage on the tenth day after operation occurred and was controlled by coagulation through the urethra.
>
> "A temperature elevation of 99 to 103 degrees took place in about 15 per cent of the cases.
>
> "The average length of stay in the hospital after the resection operation was four days.
>
> "The majority of the patients were able to empty their bladders completely following operation. No patient had over two ounces of residual urine."

These results leave little to be desired. However, such success has not been the experience of other skilled operators who have used the method. One series of over 200 cases reported by an outstanding urologist in a personal communication gave a mortality rate from resection equal to that of prostatectomy, and complications of the same frequency. It should be stated in fairness, however, that resection was performed in instances where the risk was too great for any other operation. Reports from other workers show certain facts conclusively. These are as follows: the method is technically difficult and time-consuming, the procedure is attended by a very appreciable risk to life, postoperative complications are of common occurrence and often serious. It certainly is not an office procedure as advocated by some.[4]

The question of the proper selection of cases for resection is also an important one. It seems

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to be generally agreed that obstructions due to the fibrous prostate, the median bar, or malignant disease, are particularly suitable for transurethral resection. Opinions are far from unanimous on the advisability of attempting resection in obstructions due to a benign hypertrophy. Time alone is to solve this problem and decide the question of the permanent value of resection as a method of relieving urinary retention. It is important to bear in mind the fact that persons upon whom this operation is performed must have the same careful preoperative care as though a prostatectomy were to be done, and that only a skilled surgeon is qualified to treat the inevitable postoperative complications which will result from its use. It may indeed appear that a well-managed prostatectomy carries less risk to the patient, in many instances, than the resection operation.

An *electrocardiographic* study of over 300 cases of *prostatic obstruction*[5] gives the incidence of myocardial disease in this group as 35.8 per cent. The frequency of left axis deviation and myocardial diseases in relation to age shows a progressive increase in these conditions in advancing years. Of a total of 115 cases with heart disease, 90, or 78 per cent showed abnormal electrocardiograms. This electrocardiographic study emphasizes the value of recognizing the presence of cardiac disease preoperatively in patients with prostatic obstruction irrespective of clinical cardiac signs. In a number of instances in which the clinical examination showed an approximately normal heart the electrocardiogram gave evidence of myocardial changes. It was also noticed that certain arrhythmias disappeared after prostatectomy.

Suprapubic prostatectomy with closure of the bladder[6, 7] has been the subject of numerous communications during the past year. Upon this subject we feel with Randall who expresses himself as follows, "It has long been an axiom that the more one pretties up a prostatectomy, the higher one shoves up the mortality. One must realize that it is not the existence of hypertrophic prostatic tissue in the body that is the trouble, but the effect it produces by urinary obstruction. Therefore one cannot conclude that with the removal of the prostate one has removed the patient's clinical trouble. There follows after the removal, the delicate readjustment of the effects of that obstruction, which have to be most carefully dealt with. If any one thing has brought prostatectomy to its present success, it has been the understanding of preoperative drainage. If anything will carry it further, I think that the greatest factor will be competent postoperative drainage, and for that reason I fear this procedure."

As regards the selection of the appropriate operation for benign prostatic obstruction, opinions have ever varied. Hugh Cabot[8] contributes the following: "It of course goes without saying that in any attempt to state one's present opinion briefly, dogmatism is unavoidable, and I shall undoubtedly appear dogmatic where there is certainly room for broad difference of opinion.

"In general three types of prostatic operation are at our disposal: (1) the suprapubic approach; (2) the perineal approach, and (3) the transurethral approach.

"Suprapubic approach.—This method of attack may be used for either one or two stage procedures and has that advantage over the other methods. In general I believe it to be the approach of selection for patients with markedly enlarged prostate glands of the fibroadenomatous type. For them the perineal route appears to me fraught with more complications, although giving a probably lower mortality, and it has yet to be shown that the transurethral method can satisfactorily deal with these cases if the possibilities of regrowth are allowed for.

"One stage suprapubic prostatectomy.—This appears to me to be the method of election for patients in good general physical condition and good condition as regards the urinary tract. In properly selected cases it appears to give the most satisfactory permanent results at a risk which is not excessive. It is not suitable for patients for whom prolonged preliminary drainage is required or for patients for whom every possible means must be taken to diminish operative risk. In general it will be best suited to patients in the younger age groups with marked prostatic enlargement, with sound cardiovascular systems, and with minimal injury to the upper urinary tract. It will rarely be suited to patients with large amounts of residual urine or to the patients in the older age groups for whom operation is inevitably a risky business.

"Two stage suprapubic prostatectomy.—This is particularly suited to patients who require prolonged drainage since urethral drainage by means of a catheter inevitably increases the infection of the prostate gland and bladder and cannot be satisfactorily carried on for long periods. It is also the method of election for patients who for any reason are poor risks, and the inevitable risk must be diminished by every available means. It is valuable for patients with large prostate glands or marked infection of gland and bladder for whom drainage will permit abatement of the infection with marked shrinkage of the gland, thus considerably diminishing the risk of its removal. It should be noted that it is applicable not only to patients with marked prostatic enlargement but also to those with smaller prostate glands or even fibrous glands for whom drainage is required. In this way it may be utilized not only as the first stage of a suprapubic prostatectomy but also as a preliminary to perineal prostatectomy or to transurethral methods of attack. Although the two stage procedure has commonly been

thought of as an important aid in eliminating the risks of infection of the prevesical and perivesical spaces, this appears to be one of its lesser recommendations. We are tending to prolong considerably the interval originally suggested as desirable between the first and second stages. The commonly recommended interval has varied from one to two weeks, but I find that we are prolonging the interval in most cases very considerably. If, as I believe, one of its greatest advantages is prolonged relief of urinary difficulty, which allows general improvement in the patient's condition as well as local improvement in the urinary tract, then an interval of at least one month and often two or three months will better satisfy the requirements. Since it is done chiefly to diminish the risk, this lengthening of the time between the stages of the operation appears to us more likely to satisfy all of the requirements.

"Perineal prostatectomy.—I believe that this operation is best suited to patients with small or moderately enlarged prostate glands and that it is at a distinct disadvantage where the larger types must be dealt with. It will be generally admitted that it has a lower mortality but this is largely offset by the considerably higher percentage of complications, chiefly fistula and incomplete urinary control. Of this latter difficulty Keyes in a recent article pungently says, 'The dribbling is, of course, the privilege of the perineal prostatectomist.' Although perineal prostatectomy has not been much employed as the second stage following prolonged suprapubic drainage, I have long believed that it might well be used in this way.

"Transurethral resection, the so-called punch operation.—Although this operation probably began with the original punch procedure advocated by Young it has been much extended particularly during the last five years. It has a field practically the same as that which I have suggested for perineal prostatectomy and can be used either as a primary procedure or as the second stage after suprapubic drainage. Since it is still undergoing rapid and considerable modification it is undoubtedly too early to express an opinion as to the place which it will finally occupy. On the evidence at present available it appears to me well suited to the treatment of the small chiefly fibrous obstructions at the neck of the bladder. In the hands of several operators, particularly Dr. Bumpus of the Clinic, it has yielded excellent results in the cases of moderate fibroadenomatous hypertrophy whether of lateral or median lobes. Although its advocates put it forward as applicable to the much enlarged prostate glands, their case is, I think, yet to be proved. In this group regrowths from the considerable remaining portions of the adenomatous hypertrophy are likely to occur, and the evidence is as yet lacking to show that for these cases reasonably permanent results can be obtained. It will be noted that we suggest for it a field similar to that of the perineal operation and it appears to me not improbable that it will largely supersede this procedure for this group. It certainly carries a mortality equally as low as the perineal approach. It is far less likely to be followed by the unfortunate complications of perineal prostatectomy referred to and will on the average require less confinement to the hospital than any other procedure. If its progress is not marred by overenthusiasm, it should have a brilliant future."

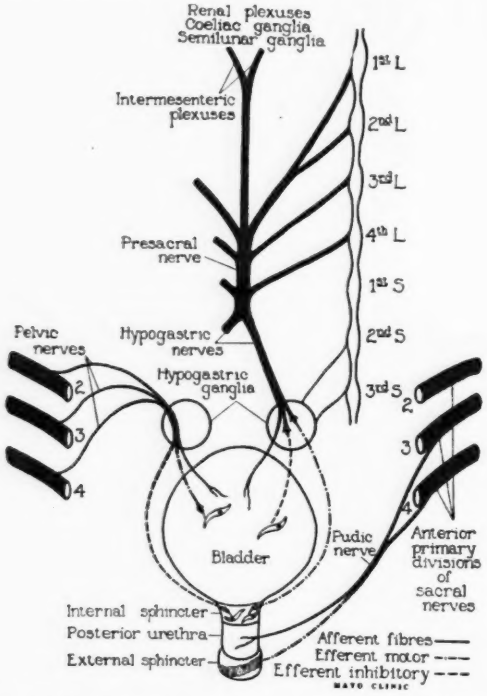
Little advance has been made during the past year in the treatment of the *malignant prostate*, one of the most difficult problems in urology. Barringer[9] still strongly advocates the use of radium, believing that the possibilities of radical surgery have been exhausted in controlling cancer of the prostate, and that radium offers further possibilities. Although the average adenocarcinoma is a radio-resistant tumor, he believes higher doses of radium will be effective in the control of this form of cancer. He now uses large doses of gold-screened radon placed in the prostate by suprapubic cystotomy rather than application through the perineum as was formerly done. Twenty per cent of the active cases of cancer of the prostate at the Memorial Hospital are said to be still under control after 5 years, as compared with 10.8% in the first reported series. Encouraging as this report seems, it is doubtful if his results are equaled in other clinics.

The importance of the sympathetic nervous system in internal visceral pathology is being recognized and a better understanding of its relation to certain diseases of the urinary bladder has resulted in the application of surgery for the relief of dysfunction of this organ. Learmonth, of the Mayo Clinic, has done progressive work in this direction and has assisted in the clarification of the nerve supply of the bladder.

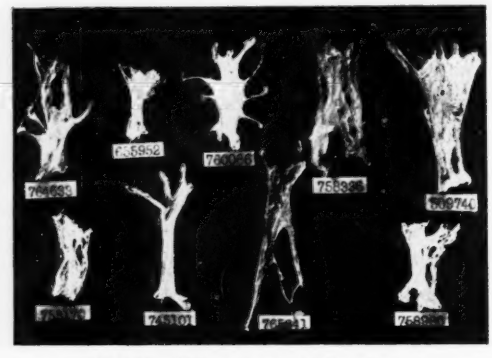
The presacral nerve is a complex group of sympathetic fibers situated just below the bifurcation of the aorta, arising by fibers from the lumbar sympathetic ganglia. It provides most of the sympathetic supply of the bladder[10]. The following diagrams, illustrating the structure of the presacral nerve and its relation to the bladder, are reproduced through the courtesy of Dr. Learmonth.

Resection of the presacral nerve has been employed for the relief of a variety of diseases of the bladder. Brilliant results in the restoration of function in this organ have been obtained in some cases, particularly where retention has been due to partial destruction of the nerve supply. It is believed that in some instances there is a lack of balance or coördination between the sympathetic and parasympathetic nerves supplying the bladder and that where disease or injury has caused urinary retention

by damage of the parasympathetic nerves and a resulting impairment in the efficient muscular contraction of the organ, resection of the presacral nerve will remove the inhibitory effect of the sympathetic nerves, relax the internal sphincter, and allow the weakened parasympathetic fibers to act unhindered. As an example of the brilliant results which have been ob-



NO. 1. Diagram of nerve supply to the urinary bladder in the human being.

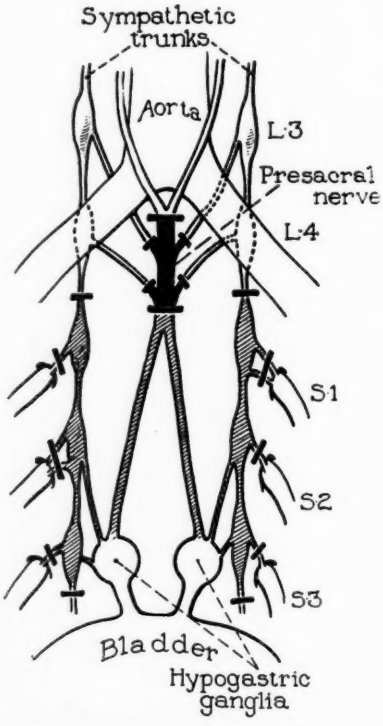


NO. 2. Types of presacral nerve.

tained from this operation the following case, previously reported, serves as an illustration:

The case is that of a boy of sixteen admitted to the Massachusetts General Hospital on June 4, 1931. He complained of an ulcer of the left foot of over a year's duration, and difficulty in emptying the bladder. The patient was born with a meningocele which had been operated upon at one year of age. Other congenital physical abnormalities were clubbed feet and torticollis. Ever since he could remember, wetting the bed at night had been of common occurrence but more particularly so in recent years. During the past two and half years urinary control had been poor and there had always been urgency and frequency of urination. Occasionally he had been unable to empty the bladder at all, although the organ felt full.

Physical examination showed a well-developed and nourished youth with an operation scar in the lower lumbar region accompanied by marked hyperesthesia of the surrounding skin. Both feet were somewhat clubbed and the left foot was the site of a chronic draining ulcer. In the lower sacral region there was a pilonidal



NO. 3. Operation for vesical pain.

sinus. Well-marked changes in cutaneous sensation were found. Anesthesia was present over the medial half of each buttock extending down the back and sides of the legs in a symmetrical pattern. The perineum, scrotum, and most of the penile skin were anesthetic. The posterolateral aspects of both legs from groin to ankle and both feet were insensitive to pin pricks. Position sense of the toes was absent and sensations of heat and cold in the feet were lacking.

The bladder contained five ounces of cloudy, purulent residual urine. Cystoscopic examination showed only an infected bladder mucosa and some trabeculation. Intravenous pyelograms demonstrated normal kidneys and a barium enema showed a normal large bowel.

Attempts to improve bladder function by the elimination of infection through catheter drainage resulted in no improvement, residual urine

varying from five to twelve ounces. On July 28, 1931 the presacral nerve was resected together with an excision of the left second, third, and fourth lumbar sympathetic ganglia by Dr. W. J. Mixter. For about two weeks following operation the bladder was kept at rest by an indwelling catheter. Convalescence was smooth and the patient was allowed to go home in three weeks. Shortly before discharge the residual urine was fourteen ounces. Frequent catheterization was carried out at the patient's home and on December 9, 1931, about four months after operation, he reported to the hospital. There had been an improvement in the bladder symptoms in that the bed was less often wet at night and urinary control was better. The residual urine measured three ounces and there was less frequency. He was still unable to always voluntarily start the urinary stream, however, frequently waiting for it to start spontaneously. On December 23, 1931 it was found that he completely emptied the bladder, there being no residual urine present.

According to Learmonth, the outstanding indication for the operation is evidence of injury to either the central or the peripheral part of the parasympathetic system, when the central or peripheral parts of the sympathetic system are intact. The patient must, of course, be continent[12].

"The clinical data must point to reduction of the function of the pelvic nerves (aptly called by Rose the 'emptying' nerves of the bladder), while the hypogastric nerves are uninjured; in other words, the balance of vesical innervation is disturbed, and injured pelvic nerves are handicapped in their task by the 'brake' action of intact hypogastric nerves. As a corollary, there must not be total paralysis of the pelvic nerves, in order that after removal of the brake the residual expulsive power of the detrusor muscle may be more equal to emptying the bladder. Again, the patient must be continent, through the action of the external sphincter muscle, for the hypogastric nerves are the motor nerves to the internal sphincter. Finally, there must be satisfactory renal function." Some of these facts are not easily determined clinically.

"It is true that it is possible to interrupt even the whole sympathetic pathway of a normal animal, without producing permanent and complete dysfunction of all its viscera (Cannon) a fact which would appear to dispose of the propriety of any visceral sympathectomy. This point has been overemphasized by physiologists. Sympathectomy is not performed on normal persons. As the field of neurosurgery widens, it is becoming abundantly clear that there are many pathologic conditions of visceral function in which the primary factor is neuromuscular or neurosecretory imbalance. In these cases, whether the defect is congenital or acquired, it is possible to restore satisfactory function to a viscus by restoring its quota of sympathetic or parasympathetic impulses. In some such cases, for example in Hirschsprung's disease, abnormal function in a viscus is replaced by normal function, in others, for example in cases of paralysis of the bladder, for one abnormal function another is substituted, with the fundamental difference that substituted function, although abnormal, is wholly satisfactory in the economy of the patient." (Learmonth[10].)

Resection of the presacral nerve has been employed for the relief of pain in such diseases as pan-mural of interstitial cystitis and in tuberculous cystitis. In such patients pain has been entirely controlled by presacral nerve section in some instances and partially in others[13].

Until recent years little had been accomplished in relieving the distressing urinary retention caused by *spina bifida occulta*, although urinary tract sepsis has always been a frequent cause of death in these unfortunate cases. A certain number of these individuals can be cured or benefited by surgery as an increasing number of reported cases testify. "Spina bifida occulta is a congenital defect found most commonly in the lumbo-sacral region and is frequently associated with other abnormalities which are responsible for the appearance of symptoms. The abnormalities usually consist of masses of fibrous tissue, fat and muscle tissue which are located in or near the bony defect, and by extension interfere with the function of the nervous structures underneath the cleft. Developmentally, the most probable process of malformation is one which affects primarily the bony structures. Operative interference by laminectomy has yielded a relatively high percentage of beneficial results[14]."

A very clear summary of *kidney tumors* by Smith and Ferris is given in detail[15]. "Renal neoplasms are broadly divided into two classes; first, those in the renal pelvis, and secondly, those which are found in the cortex. The pelvic tumors are less commonly encountered and are well understood. They may be said to correspond quite accurately to the epithelial tumors of the bladder, being derived as they are from the same parent tissue. They may be divided into two chief types, the papillary and the squamous. Their malignancy may be quite accurately measured by histological gradation of their cellular mutation, the papillary form being the least invasive, and having the lowest mortality rate. The squamous form, on the other hand, unlike the papilliferous tumors, tends to invade more extensively, even involving the blood vessels, and accordingly is not unlikely to be associated with distant metastases. In general this group of cases is of particular

interest clinically, as it is recognized comparatively early by an associated hematuria, and characteristic pyelogram. Accordingly, its operative treatment is usually instituted at a favorable time, and three to five and even ten year cures are not at all infrequent in the literature.

"Cortical tumors: The cortical tumors are much more of a problem from the pathologist's standpoint, and even today we find no complete agreement as to pathogenesis. For years the battle has raged back and forth between the proponents of the adrenal origin of these tumors and the supporters of the origin from metanephric cells.

"The principal difficulty which has to be overcome in determining the origin of the Grawitzian (large yellow celled) type of tumor histologically is in its polymorphism. Occasionally we find tumors in which the typical arrangement of the cells is indistinguishable from that of adrenal cortex and in which this structure is uniformly found through the tumor. For the sake of argument, we might concede an adrenal origin of this type of tumor, based solely on morphology. Unfortunately, however, it is extremely rare to find such characteristic tumors. They are apt to be small, and more often found accidentally at postmortem, than during life. Whereas, on the other hand, the usual and common kidney tumor is one in which typical adrenal appearing tissue is admixed with areas showing definite tubule formation and often papillary proliferation of the cells. Marked pleomorphism may be present and it is difficult to concede a strictly adrenal 'rest' origin to such a tumor.

"As suggested, the morphology of the papillary, tubiform neoplasms strongly favors a renal tubular epithelial origin, and the more generally accepted view today subscribes to this hypothesis. The theory of Grawitz that all these tumors arise from adrenal cells is difficult to admit, nor can it be admitted that they all arise from renal epithelial cells. They are forced to conclude that both tissues may play a part in the pathogeneses of this type of tumors.

"It is quite possible that we may have actual tumors of adrenal rest origin, although the proof is most unsatisfactory. In the first place, the clinical evidence of virilism which is so apt to occur in true adrenal cortical tumors has not been reported, so far as we are aware, in a single case of *renal* 'hypernephroma'. Ewing in his chapter on tumors of the kidney concludes that true adrenal rest tumors must be of comparatively infrequent occurrence. Yet they believe that true adrenal tumors may occasionally occur. In general they tend to remain encapsulated and are more benign, though they may metastasize relatively early. The importance of their recognition histologically is because of their possibly more favorable prognosis. These tumors, however, may merely represent a more completely differentiated type of the common or garden variety of cortical tumor, a type which might be graded histologically as of comparatively low degree malignancy.

"Among the well-recognized tumors of the kidney are the tiny hyperplastic adenomata usually found in the cortex of sclerosed organs, and often multiple. Here there is general accord as to their tubular epithelial origin. But, unlike other adenomata there is no great tendency toward malignant degeneration and the intermediate stages between benign adenoma and frank adenocarcinomata is seldom found."

"Whatever their origin, these cortical renal tumors form a very definite histological and clinical group. It is to this type of tumor that the misnomer 'hypernephroma' has become inseparably attached in the minds of most clinical surgeons. They differ in morphology but fall fairly clearly into two types, first the comparatively rare "granular" cell papillary tumors with small deeply staining nuclei, and the common typically clear cell papillary adenocarcinoma, with large vacuolated cells. These tumors are apt to be extremely vascular with many areas of necrosis, and like the hypernephromata they very commonly invade the renal vein and extend along the vena cava.

"Finally, there is the important group of tumors occurring almost entirely in the first decade of life, the embryonal tumors of Wilms, often spoken of as sarcoma, adenosarcoma, or mixed tumors of the kidney. Their gross appearance is characteristic. They tend to be solid, opaque, whitish tumors, well encapsulated, infrequently showing metastasis. Microscopically they vary greatly and the stroma show typically a sarcomatous degeneration. They have a curious tendency to be bilateral and accordingly fatal, but when unilateral they may be relatively benign clinically, and a few permanent cures have been reported. These embryonal tumors of infancy and childhood are probably of renal blastema origin."

Malignant tumors of the kidney in children are not common. Most of them are mixed tumors and are often called Wilms' tumors. Wilms believed them to be composed of a variety of different tissues, developing from an undifferentiated cell tissue which has the ability to produce all the different types of tissue[16]. Regional involvement by extension is the usual method of growth, metastases occur mainly by the blood stream, usually to the liver and lungs, the bones being spared as a rule[17]. Metastases may resemble the original tumor, or only one or more of its constituents. They are said to occur late in the disease. The prognosis is bad.

A contribution to the important subject of *chronic renal infection* is in the attempt to influence this condition by diet. It was noticed at the Mayo Clinic that patients on a diet high in fat (Ketogenic diet) had a very highly acid

urine and it was suggested that the growth of the colon bacillus in the urine might thereby be inhibited. Experimentally it was found that the colon bacillus is inhibited from growing in urine at a pH of 4.6 to 5.0 on the acid side and 9.2 to 9.6 on the alkaline side. Its optimal growth was at a pH of 6.0 to 7.0, which is the average reaction of the urine of a person on a mixed diet[18]. Urine containing ketone bodies with a pH of 5.1 to 5.62 was bactericidal, and the control urine, with one exception, at the same pH was not bactericidal. In these experiments, and other control experiments, bactericidal action was never observed when the normal urine showed a pH of 5.2 or higher, so that the bactericidal action of urine at a pH of 5.3 to 5.8 was thought to be due probably to some substance or substances that are bactericidal for other reasons than their acidity. Two patients with anomalies of the urinary tract were rapidly cured of urinary infection by means of the ketogenic diet. Former therapeutic results in the clinic forced the conclusion, it is said, that urinary infection in the presence of anomalies, could not be cleared by any form of medical treatment[19, 20]. It will be interesting to see what further study in this direction will show.

An unusually clear discussion of *perinephritic abscess* is given by Fowler and Dorman[21] emphasizing the difficulty in making an early diagnosis of the condition and quoting from Trousseau's early lecture on the condition before the days of bacteriology: "There is sometimes a very great difficulty in recognizing perinephritic abscess; and the difficulty continues till the local symptoms become so marked as to render it impossible not to suspect the cause of the malady." This observation on the part of the celebrated clinician must strike a responsive chord in the urologist of today in spite of the advantages of increased knowledge and facilities for making accurate diagnoses.

"Suppurative inflammation of the fatty tissues surrounding the kidney, suppurative perinephritis, or perinephritic abscess is uncommon when one considers the frequency of surgical lesions *within* the kidney, or the frequency with which one encounters non-suppurative inflammatory processes about the kidney when operating for long standing calculous disease, pyonephrosis or tuberculosis. It is not unusual to find in such cases the fatty capsule markedly thickened and transformed into a dense fibrous envelope intimately adherent to the surrounding tissues, or dense adhesions at either pole overlying the intrarenal pathology. Yet free pus about the kidney is seldom encountered. It is estimated that in the larger clinics about ten cases of perinephritic abscess are seen each year.

"At first it was thought that the organisms from peripheral skin infections reached the kidney and its fatty capsule by way of the lymphatics. It has been pointed out since, however, by various observers, that acute suppurative processes occurring so frequently in the pelvis and lower urinary tract are seldom followed by perinephritic abscess; that if metastases occurred frequently by way of the lymphatics perinephritic abscess would occur much more often.

"The contributions of Brewer, both clinical and experimental on acute unilateral hematogenous infections of the kidney are important in calling attention sharply to the hematogenous route of infection. Scott has recently been able to demonstrate blood stroma infection in the milder, transient types of infection by blood cultures. Definite proof of this kind has heretofore been lacking.

"It is usual to classify perinephritic abscess into primary and secondary. In the secondary group the primary lesion is in the kidney, the perirenal tissues becoming infected secondarily as a complication or sequel of the renal disease, either by direct extension from or rupture of the primary focus. This occurs notably in cases of pyonephrosis, either calculous or tuberculous. It rarely, if ever, occurs in pyelitis or pyelonephritis according to Braasch.

"From the standpoint of diagnosis the secondary group is not so interesting or important. The primary renal lesion is the important condition and usually is readily recognized by a routine urological study and the treatment is directed primarily to the intrarenal lesion.

"In the primary group are included all cases in which the primary form of infection lies outside the kidney.

"There is some confusion arising from this classification. This applies more particularly to the primary or extra renal group. The term primary may be misleading in that it suggests the perirenal lesion is primary when, as a matter of fact this is never the case except possibly in rare instances of penetrating wounds where the infection is carried directly to the perirenal tissues. The primary focus of infection in a vast majority of cases is a peripheral suppurative lesion from which the organisms gain entrance to the circulation, reach the perirenal tissues, and there produce infection and suppuration. The perinephritic lesion is, therefore, not primary but secondary, or better perhaps, metastatic. As a matter of fact the view now generally accepted is that as a result of the bacteriemia or septicemia complicating distant focal infection, the organisms, practically always staphylococci, are carried to the kidneys, find lodgment in the cortex, and produce cortical abscesses. These cortical abscesses exhibit a marked tendency in certain cases to extend toward the surface of the kidney and invade the fatty tissues around the kidney either by perforation of the fibrous capsule or, according to Israel, by lymphatic extension.

"Thus, while the primary focus is extra-renal

the kidney comes to play an important rôle in the etiology of metastatic perinephritic abscess."

For the relief of *sterility in the male* Hagner[22] describes the operation of anastomosis of the epididymis and vas deferens. It is especially applicable after gonorrheal epididymitis where the globus minor is most often occluded while the tubules in the globus major are usually patent. The tunica vaginalis is opened and the entire epididymis exposed. The vas is incised and a strand of silkworm gut passed down its lumen for 16 to 20 cm. to be sure of its patency. If on rectal palpation there is no evidence of infiltration of the ampulla, one can be reasonably certain the vas is patent. If it is obstructed beyond this point there is no hope of operative cure. An elliptical piece is cut out of the epididymis and, if live spermatozoa are present, a milky fluid is usually obtained as soon as the section is removed. This fluid is examined at once on a warm slide. If no spermatozoa are found the opening is closed and another place tried. It used to be thought that the spermatozoa were not motile until they came in contact with the prostatic secretion, but it is now known that they are actively motile in the epididymis even when occlusion has been present for many years.

His only successful operations have been those in which very fine silver wire has been used in the anastomosis. Usually a lateral anastomosis is performed. Spermatozoa may appear in one month to one year after operation. Of 31 cases found to be favorable at operation, 19 or 61.3 per cent are said to have been cured and 12 of these 19 have had children.

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DECLINE IN INFANTILE PARALYSIS IN MASSACHUSETTS

Thus far in 1932 forty cases of infantile paralysis have been recorded by the State Department of Public Health. For the corresponding period of 1931 there were seven hundred and ten cases.

Philadelphia seems to be the center of a mild epidemic of this disease now.

MORTALITY RATES

Telegraphic returns from 85 cities with a total population of thirty-seven million for the week ending Aug. 27, indicate a mortality rate of 9.4 as against a rate of 9.7 for the corresponding week of last year. The highest rate (15.4) appears for Duluth, Minn., and Paterson, N. J., and the lowest (4.4) for Evansville, Ind. The highest infant mortality rate (14.9) appears for Nashville, Tenn., and the lowest for Cambridge, Mass., Canton, Ohio., Erie, Pa., Evansville, Ind., Grand Rapids, Mich., Kansas City, Kans., Long Beach, Calif., Lynn, Mass., New Bedford, Mass., Spokane, Wash., Waterbury, Conn., and Yonkers, N. Y., which reported no infant mortality.

The annual rate for 85 cities is 11.4 for the thirty-four weeks of 1932, as against a rate of 12.3 for the corresponding period of the previous year.

Summary of deaths and death rates (annual basis) from automobile accidents per 100,000 estimated population for 86 cities for corresponding periods of 1932 and 1931.

	Week ending Aug. 27 1932	Aug. 29 1931	First 34 weeks 1932	1931
Total deaths	145	172	4,859	5,649
Death rate	20.6	24.8	20.3	23.9
Deaths due to accidents in city	116	128	3,937	4,513
Death rate	16.5	18.4	16.4	19.1

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASES 18371, 18372 AND 18373

A GROUP OF CASES OF GAS BACILLUS INFECTION OF INTESTINAL ORIGIN

CASE 18371

SURGICAL DEPARTMENT

PRESENTATION OF CASE

DR. TRACY B. MALLORY: We have three cases here with important similarities. I think we will present the cases first, then discuss them all together.

DR. HARRY M. SPENCE*: The first case is that of a business man of thirty-seven. His previous health had always been excellent, with no rectal complaint. He entered the hospital complaining of tenderness around the anus of three days' duration.

General examination showed no abnormality. Locally he had a tender area in the right ischio-rectal fossa, apparently a definite perianal abscess.

The temperature at entry was only 98°. There was no elevation of the white blood count.

Under ether anesthesia the anal sphincter was dilated. In doing so the surgeon broke into a small pocket of pus. He put in a small boric wick. There was nothing remarkable about the operation.

On the day of the operation the patient developed a chill. The temperature rose to 104.5°. There was nothing in the local condition indicating any complication. The first and second days after operation he complained of suprapubic pain and tenderness which we thought were probably due to the bladder. Catheterization gave the usual quantities of normal appearing urine. The third day after operation the patient, who had been running a temperature from 102° to 103°, became definitely worse. About six o'clock in the afternoon while talking with a visitor he went suddenly into collapse. Examination at this time revealed a blood pressure of about 60/30 and some tenderness and questionable crepitation in the right flank. He was taken to the operating room, a small incision was made and a little serosanguineous material obtained. He died on the operating table.

*Senior interne on the West Surgical service.

CASE 18372

SURGICAL DEPARTMENT

PRESENTATION OF CASE

DR. SPENCE: The second case is that of a married Italian housewife forty-two years old. She had previously been healthy except that she was just completing a nine weeks' course of arsphenamin treatment for syphilis.

She entered the Emergency Ward at five o'clock in the afternoon. The story was that twenty hours previously she had taken a hot olive oil enema given with a large nozzle. We assume she had taken it for chronic constipation. Fifteen hours before she came in, five hours after she took the enema, she had itching about the anus. Her husband said she had a black area two inches in diameter at this time. Nothing was done about that and no doctor was called until three hours before entry, seventeen hours after the enema. The doctor immediately sent her to the Emergency Ward.

Physical examination revealed a well developed, well nourished Italian woman in very severe toxemia, quite irrational and attempting to scratch her buttocks. Again the general examination revealed nothing abnormal. Over the buttocks however, with the anus as a center, there was a very large blackened, purplish, crepitant, swollen area with a red border. We did not do a rectal examination. So far as we could see there was no abrasion of the mucosa at any point. We thought, although the case looked quite hopeless, the one chance was operation. A very rapid and very extensive débridement of both buttocks was done, outlining the area of gangrene by a large incision and excising it down to the level of the levator muscle, cutting well outside the affected area we thought at the time. There was practically no bleeding. The patient died in shock, however, about four hours later.

CASE 18373

SURGICAL DEPARTMENT

PRESENTATION OF CASE

DR. W. FENN HOYT*: The third case is that of a woman of fifty-eight whose illness went back over a period of sixteen years.

Sixteen years before entry she had an attack of cramp-like pain in the right upper quadrant accompanied by jaundice and clay colored stools. She was in bed twenty-one days and recovered from this attack without operation. For twelve years she had recurring attacks, usually in the autumn. Then for four years she was completely free from any symptoms referable to the gall bladder. Two and a half months

*Graduate assistant in Surgery.

before entry she had a recurrence of cramp-like pain in the right upper quadrant. The pain came on shortly after eating and radiated through the back to the right shoulder blade. There was nausea and vomiting but no jaundice. The pain was relieved by vomiting, defecation and hot packs. After being in bed for two days she got up and went down town, where she had a severe pain, worse than any she had had before. She came home with a temperature of 103° and passed a large concretion which was said to be a gall stone. This was accompanied by blood, and the stools for days afterwards were blood streaked. Following that she had no further rectal bleeding. She had some gas pains, increasing constipation, and lost 11 pounds in weight. She was studied in the Outpatient Department of this hospital, where a Graham test showed no filling of the gall bladder. She was sent into the wards with a diagnosis of gall bladder disease.

Physical examination at entry showed an obese woman with tenderness in the right upper quadrant over the gall bladder and also a palpable and very tender mass in the left lower quadrant.

Her temperature was 99.6° by mouth.

We felt at that time that she had two definite processes, one gall bladder disease, the other some pathology in the sigmoid, either of an inflammatory nature or malignant. On rectal examination we were able to feel a mass high on the left, but by pelvic examination it was not connected with the uterus.

X-ray examination with a barium enema was unsatisfactory as the patient was unable to retain the enema. The rest of the gastro-intestinal series was negative.

The patient ran some temperature, reaching as high as 100.6° during the three or four days she was under observation. We felt that exploration ought to be done, believing that the mass was either malignancy or diverticulitis.

At operation a cancer was found involving the sigmoid with the small bowel densely adherent to it. In an attempt to separate the small bowel from the sigmoid the small bowel was opened. The portion which was adherent was resected and an end to end anastomosis done. The growth in the sigmoid was excised and the two cut ends of the sigmoid were brought out into the wound in the abdomen. This was done under some tension, as the abdominal wall was quite obese.

After the operation she was in fairly good condition for the rest of the day. The pulse was elevated slightly and the temperature was normal. The day after operation she became very cold and cyanotic and grew progressively worse. The wound at that time did not appear to be different from the average wound found at that stage. She died at 2:42 the morning of the second day after operation. Her death was very sudden, suggesting a pulmonary embolus.

CASE 18371

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Rectal abscess.
Aerogenes capsulatus infection of the pelvis.

ANATOMIC DIAGNOSES

Perirectal abscess with extension into the prevesical and retroperitoneal spaces.
Bacillus Welchii septicemia and peritonitis.
Bacillus Welchii infection of the abdominal wall.
Pulmonary atelectasis.
Cholelithiasis.

CASE 18372

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Gas bacillus infection, perirectal.

ANATOMIC DIAGNOSES

Acute fulminating septicemia, vibrion septique, with generalized visceral emphysematosis.
Operative wound: radical excision of buttocks and perianal tissues.
Acute necrosis of the gluteal perineal region.
Pulmonary congestion and edema.
Atelectasis.
Arteriosclerosis, slight aortic.
Fibrous pleuritis, left.

CASE 18373

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Carcinoma of the sigmoid.

ANATOMIC DIAGNOSES

(Adenocarcinoma of the colon.)
Metastatic adenocarcinoma in the liver and retroperitoneal lymph glands.
Operative wounds: resection of the sigmoid, colostomy, resection of the jejunum with end to end anastomosis.
Bacillus Welchii septicemia.
Local peritonitis.
Retroperitoneal abscesses.
Fatty degeneration of the liver.
Acute endocarditis (?) of the aortic valve.
Arteriosclerosis.
Old fibrous pleurisy.
Healed apical tuberculosis.
Cholelithiasis.

Pathologic Discussion

Dr. Mallory: Of these three cases the last one does not at first sight seem to have much relation to the other two. Obviously the patient had a very chronic gall bladder disease and later carcinoma of the large intestine. The cancer was resected. She died rather suddenly

after operation. Cultures from that case showed a bacillus Welchii infection of the peritoneal cavity, septicemia and a certain amount of gas formation in the liver and spleen. Taking the other two cases in reverse order, the second patient was a woman who administered an enema to herself and within a very few hours developed local symptoms in the region of the rectum followed by death within less than forty-eight hours, rapid development of gangrene and an attempt at débridement with no effect on the fatal issue. The first case had originally a perirectal abscess. An attempt was made to drain it and infection developed, the process dissecting through the loose areolar tissue of the pelvis. Any of you who have done autopsies or watched us remember how one can very easily dissect around all the pelvic organs merely with the fingers and strip the pelvic peritoneum if one gets into this plane of areolar tissue. It is very loose and it is relatively easy for an infectious process to spread in it if it once gets into the cleavage plane. In this case that had happened, and we had a dissection almost like the one we do at the autopsy table, though the process had in this instance worked around both sides from behind and finally met in front of the bladder. This case too showed gas bacillus infection.

Gas bacillus infection is of course a very common experience in every hospital in the big group of cases of gangrene of the extremities. Fortunately it is not particularly common in the group of cases coming to intestinal surgery. Why it is not more common is rather a mystery, and it is that on which I should like to focus the discussion today.

Dr. Richard H. Miller: In regard to those rectal cases, they are the first two that I have seen of gas bacillus infection in this location and to me they are interesting because the infection entered the same part of the body but in one case went above the levator ani muscle and in the second stayed below it. If you remember, the levator ani arises along the sides of the pelvis, extends downward and is inserted into the sphincter ani muscle. In my case, the man with the perianal abscess, the manipulation which I did in stretching the sphincter probably afforded a place of entrance for the bacteria so that they got up above the levator ani and dissected around, as Dr. Mallory said. In the second case the entrance did not allow the bacteria to get up above, but they made an entrance into the subcutaneous tissue of the buttocks. It is well to realize that this infection may occur after intestinal operations, and why it does not occur oftener I am sure I do not know. Certain people have advocated taking the precautionary measure of prophylactic gas antitoxin in all intestinal operations as well as taking measures against tetanus.

Dr. Mallory mentioned the prevalence of gas bacillus infection in gangrene of the extremities. There is also a third class of cases in which we see it clinically, that is gunshot wounds and dirty street wounds.

A few months ago, having seen a number of cases of gas bacillus in the hospital we decided to look into the value and efficacy of the commercial preparations offered in the market today as antitoxins against gas bacillus infection, and Dr. Linton was given the assignment; perhaps he will tell us what he found.

Dr. Robert R. Linton: I became interested in gas bacillus infection chiefly in the Peripheral Circulatory Clinic, because there I had several cases of gas bacillus infection complicating gangrene of the lower extremities. That led to further investigation of the subject. I have had the cases of gangrene or gas bacillus infection in this hospital looked up over a period of twenty years. I have a summary here.

In the period from 1911 to 1930 inclusive, that is, in twenty years, 43 cases are reported in the hospital records. Of those 43 cases 32 were traumatic, gunshot wounds or compound fractures. In the peripheral circulatory group there were 8 cases. Those went back only about ten years, so I presume we have had more but they were not classified under this head. The third group is a miscellaneous group of 3 cases. One of these was acute appendicitis, one mediastinitis and in the third the infection followed a subpectoral in a case of carcinoma of the prostate.

Of the 32 traumatic cases 16 died and 16 recovered. Of those 32 there were only 4 in which anti-gas bacillus serum was given. None of the treatments were prophylactic; all were given after the diagnosis had been made. Of the 4 that received it 3 died. Of the 8 cases in the peripheral circulatory group 4 died and 4 recovered. Two of the patients who lived received treatment with anti-gas bacillus serum, and one of the patients who died received that treatment. None received the prophylactic treatment. In the miscellaneous group of 3 all died. None received anti-gas bacillus serum.

I think those figures are interesting. We cannot say from them that anti-gas bacillus antitoxin is or is not of value. Once a case has developed a fulminating gas bacillus infection the probability that the serum will do any good is rather doubtful, because there is usually a blood stream infection by that time, and if that is the case the value of the serum is questionable because the serum is antitoxic, not antibacteriocidal. On the other hand I think the fact that we have not used prophylactic serum, especially on cases in the traumatic group, is something we should look into.

The literature abounds in articles on the treatment of gas bacillus infection with anti-gas bacillus serum. During the war it was found by

the French to be of great value. The cases that received it prophylactically at the front did not develop gas bacillus infection with nearly the same frequency as those that did not receive it.

The prophylactic serum is put up by a number of companies. We have used the Lederle serum in this hospital because we can obtain it so readily. Their prophylactic serum contains 1500 units of tetanus antitoxin and 10 units each of Perfringens or bacillus Welchii and vibrion septique antitoxins. The preparation we have been using in the past year is Perfringens antitoxin. The second case reviewed today was a case of gas bacillus infection following a hot oil enema. We investigated the type of the organism in it and found it to be vibrion septique. If we had used Perfringens antitoxin in this case it would have been of no value. Therefore it seems that if one uses any antitoxin one should use a polyvalent serum. The curative treatment contains several other organisms which have not been included in the prophylactic dose.

I think the main point, especially in the peripheral circulatory group, is that we do not have to worry about gas bacillus infection if we are dealing with an extremity at a point where the circulation is adequate to oxygenate the tissues normally. The cases in which gas bacillus infection has been seen have usually been those in which the lower leg has been amputated and the circulation has been inadequate at the level of the amputation. In those cases which did develop it in the lower leg and have had thigh amputation done secondarily there has been no development of gas bacillus infection. So I think nature has probably provided good prophylaxis where there is a good blood supply. I think also that is probably the reason why we do not see gas bacillus infection more often in intestinal operations. Various drug houses recommend the use of prophylactic doses of serum in some cases of intestinal obstruction and also in appendicitis with peritonitis. I doubt very much whether that is necessary in this hospital, because here the incidence of gas infection in such cases is very low. We have had only one case in the past twenty years.

DR. MILLER: May I say just another word? In the first place there was not much gas bacillus antitoxin used during the war. I served with the troops in the American army and I never saw any at all. If there was any it was a very small amount.

In the second place—something I never understood—surgeons in the field hospitals used to say that in gunshot wounds of the thigh gas bacillus infection very frequently localized to one muscle or one set of muscles. If that is the case the infection can be overcome by doing a complete removal of the one, two or three muscles.

The third thing is that I had another fatal case of this infection following operation for acute intestinal obstruction and this seems to be in the minds of some men the commonest cause for gas bacillus deaths. Some of the surgeons in England advocate giving a prophylactic dose of antitoxin whenever one is about to operate on an acute obstruction. So far as I am concerned, I should always in the future give this antitoxin preoperatively, if I could get it, in any case of acute obstruction.

DR. MALLORY: We know that the human intestinal tract and the intestinal tract of many animals normally contain bacillus Welchii and various other anaerobes in considerable numbers. Tetanus, which is usually present in the intestinal tract of horses, has frequently been found in human feces. The relative proportion of different anaerobes present in the large intestinal contents would depend very largely on the geographical region from which the individual one is studying comes. It is well known that in certain parts of the world, notably in Belgium, Jamaica and Argentina, the occurrence of tetanus is very much higher than in many other countries. An increased frequency of gas gangrene to some extent corresponds with places in which human fecal material is used for fertilizing the soil. We cannot explain it entirely on such a ground however. I think we must assume a wide variation in virulence in different types and strains of these organisms. Comparatively little work has been done on that. There are no standard methods for determining the virulence of any of these strains. In only a few places has any intensive bacteriologic work been done on the nature of the anaerobes. During the war they were carefully studied by adequately equipped laboratories. The British, French and Germans did excellent work and found several new types of gas producing anaerobes which are all of clinical importance. We have seldom tried to run down the strains we have had here, but we did do it on one of these cases that we are presenting today, the second case, the one with the story of the patient's giving herself an enema. It seemed obvious that with trauma so slight followed by development of a condition so fulminating we were dealing with an organism of more than usual virulence. Cultural methods for separating those organisms are slow and quite uncertain. The only practical way is to do a protection test with antiserum. That was what we did here.

EIGHT GUINEA PIGS INOCULATED WITH FOUR MONOVALENT GAS BACILLUS ANTISERA (LEDERLE)

Antisera	Heart's blood 24 hours later		Results
1 Vibrion septique	1 c.c.	0.01 c.c.	Alive
	2 c.c.	0.01 c.c.	
2 Sordelli	1 c.c.	0.01 c.c.	Dead within 24 hours
	2 c.c.	0.01 c.c.	
3 Perfringens	1 c.c.	0.01 c.c.	
	2 c.c.	0.01 c.c.	
4 Edematiens	1 c.c.	0.01 c.c.	
	2 c.c.	0.01 c.c.	

The culture of the organism was injected into a series of eight guinea pigs. We attempted to protect them with each of four individual sera. They all had the same dose. As you see, two of them were protected. The two animals protected with vibrion septique remained alive in spite of a fairly large dose of organisms. The animals given the other three types of serum all died within twenty-four hours, some of them within a distinctly shorter period. This method of analysis is applicable in all these cases, but it is somewhat difficult to carry out in practice. In the first place one must keep in stock all these various sera, and it may be months before one has an opportunity to use them; also, many pigs are used, so it means considerable expense. We do however feel that it is a very important thing to do, because until we know definitely the organism we are dealing with we cannot begin to combat it.

DR. LOUIS DIENES: Dr. Mallory has perhaps exaggerated a little the difficulties of identifying these organisms. Where one is dealing with pure strains, cultural methods alone are adequate to identify a bacillus Welchii. Non-lactose fermenters, however, might easily be missed.

DR. FRANKLIN G. BALCH, JR.: I should like to ask Dr. Linton whether he thinks we ought to give that serum prophylactically in cases of compound fracture.

DR. LINTON: Yes, I feel definitely that we should. There is a man in the wards now who came in with a fracture of the ankle joint. He was treated surgically and the wound was cleaned out thoroughly with irrigations of normal saline solution. He received tetanus antitoxin, but he did not receive any gas bacillus antitoxin. Within twenty-four hours a fulminating infection set in, necessitating thigh amputation. That is the type of case in which a prophylactic might have saved the patient a thigh amputation.

DR. MALLORY: I think the real probability is that the vast majority of strains of bacillus Welchii are of very low virulence and are ordinarily incapable of causing progressive infection in healthy tissues. If however we have that organism in traumatized tissue or tissue with deficient blood supply even an organism of low virulence will very readily cause trouble. Possibly general metabolic abnormalities such as diabetes may also lower resistance to it.

It is rather interesting that death in some of these cases was very sudden. In one case, you remember, a question of pulmonary embolus was raised on account of the rapid failure of the patient. Some ten years ago an Englishman named Henry, working with strains of bacillus Welchii, found that certain ones produced a very strong toxin which seems to be very different from any other known bacterial toxin. If a heart is perfused with it, the heart stops within ten minutes, whereas if a heart is perfused with diphtheria toxin nothing happens within six to twelve hours at least after administration of the toxin. Certain lesions, for instance myelin sheath degeneration, do not come on until ten days after exposure to the toxin. It is most unusual for any toxin to have such a short period of incubation between the time of exposure and the appearance of signs. I think it is very possible that in some of these cases we may get a direct effect on the myocardium.

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SPARE THE ADENOID!

ANOTHER Daniel, let us hope, has come to judgment in the person of Dr. Henry B. Lemer of Los Angeles, who, writing in the *American Journal of Diseases of Children* (43:1494, June, 1932) expresses the belief that this maligned adenoid is not a "vegetative growth"; a pariah; but a physiologic structure, beautifully designed and patterned, and a normal organ in the human body.

In contradistinction to the tonsil, which may remain a source of infection once infection has entered it, Dr. Lemer conceives of the adenoid as a lymphoid structure far more capable of resisting infection and a positive asset in the production and maintenance of immunity.

"The opinion that the adenoid is harmful," as he expresses it, "has run through the years, and until recently no one even questioned the many charges against it. I will try to name them as briefly as possible. It is charged that:

"1. The main source of mouth breathing in children is caused by the obstruction due to hypertrophied adenoids.

"2. Deafness and discharging ears are due to infection from adenoids and mechanical obstruction from pressure over the mouth of the eustachian tube.

"3. They are the cause of sinus disease which clears up after their removal.

"4. Even after their removal a small amount of lymphoid tissue remaining in the nasopharynx may produce all the aforementioned symptoms.

"5. Any adenoid found in the nasopharynx should be removed.

"During my study of the adenoid the following possibilities came to my mind:

"1. The adenoid is a physiologic lymphatic structure with a definite, beautiful form, both grossly and microscopically, admirably designed to expose the greatest possible lymphatic surface as a barrier to the entrance of nasal infection falling into the nasopharynx, and thus gaining access to the general circulation.

"2. In children, pus drifts into the adenoid from the nose and sinuses, and does not come from the adenoid itself.

"3. Occlusions of pus can take place in the adenoid, but they are very rare.

"4. The throat may be better if protected by a physiologic adenoid than by the mucous membrane of scar repair resulting after its removal.

"5. Mouth breathing is frequently caused by nasal infection."

Acting on these premises, Dr. Lemer, in a series of more than 300 children, left the adenoids at the time the tonsils were removed. "Nasal hygiene" was instituted and insisted upon, consisting of daily expulsive blowing exercises as after-treatment. In this group, perhaps as a result of leaving the adenoids undisturbed, nasal breathing improved and colds and sinus symptoms and acute and chronic aural conditions were less frequent.

In an age of universal surgery on the upper respiratory tract, Dr. Lemer has let fall an idea which may be well worth cultivating.

CERTAIN TYPES OF ADVERTISING

AMONG various efforts to promote the sale of alleged medicinal remedies the publication of endorsements of a given product by physicians has been a common practice, often anonymously in general terms such as "approved by the medical profession" or words to that effect. Occasionally a brazen pretender will even cite in his literature the name of a famous physician as an endorser. Reference to the alleged approval

of the employment of a substitute for insulin by a Boston authority appeared in an advertisement in a clipping forwarded to us recently. Another plan which has worked successfully is to set forth, in more or less technical phrases, studies or experiments relating to the application of certain products to diseases with assertions of beneficial results. This was common practice by some of the large manufacturing organizations in former years and was often commercially successful until the Council on Pharmacy and Chemistry of the American Medical Association took upon itself the responsibility of investigating published claims. This led to an adjustment of policies, by the better class of manufacturers of pharmaceuticals, in conformity with the standards of the Council, but some still try to conduct informative courses through the mails. It is common knowledge that new remedies brought out by manufacturers are presented to the profession through the mails with the apparent purpose of promoting their use.

Here and there are recrudescences or modifications of the older practices of which one striking example appears in an invitation to a prominent practitioner of Boston to call on the sponsor of the alleged valuable results attributed to the influence of the ductless glands together with an adroitly worded pamphlet under the title of "The Story of Your Ductless Glands" with the explanation that it is "a compendium of absolute knowledge" discovered by great biologists, students of Endocrinology and followed by the names of more than fifty recognized authorities in various fields of practice and research.

At the top of the letter the name of the writer appears as the originator of ALO-GLAN 100% ACTIVE—THERAPEUTICALLY PURE GLAND FOOD PRODUCTS.

This man has issued an invitation for an inspection of a "mighty fine display of active glands" before a certain date because after that time he is obliged to be in another city to "await the coming of the 100% prenatal gland baby my wife is building. Mrs. — was a congenital Thyroid and Supra-renal deficient, and this case should hold a lot of interest for the distinguished group of physicians . . . who will be in attendance."

It is reasonable for a physician to feel annoyed with the methods employed by such people and for such invasions of one's time some method of investigation of the concern and its products seems appropriate.

If in this instance, the State Society would conduct an investigation and issue an opinion as to the merit of the advertised product, it might be of sufficient interest to the Boston Better Business Bureau to lead to more effective action.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

SPRAGUE, HOWARD B. A.B., M.D. Harvard University Medical School 1922. Assistant Physician, Massachusetts General Hospital. Visiting Physician and Research Director, House of the Good Samaritan. Assistant in Medicine, Harvard Medical School Courses for Graduates. Address: 270 Commonwealth Avenue, Boston. Associated with him are

BURCH, HOBART A. B.A., M.A., M.D. Harvard University Medical School 1929. Medical Interneship, Henry Ford Hospital 1929-1930. Medical Residency, University of Colorado General Hospital 1930-1931. Address: 120 South Oneida Street, Appleton, Wisconsin. And

WHITE, PAUL D. A.B., M.D. Harvard University Medical School 1911. Physician, Massachusetts General Hospital. Instructor in Medicine, Harvard Medical School. Address: Massachusetts General Hospital, Boston. Their subject is "Adherent Pericardium and Pick's Syndrome. An Autopsy Study." Page 483.

CANNON, WALTER B. A.B., A.M., Hon. S.D., Hon. LL.D., M.D. Harvard University Medical School 1900. George Higginson Professor of Physiology, Harvard Medical School. Address: Harvard Medical School, Boston. Associated with him is

DRINKER, CECIL K. B.S., M.D. University of Pennsylvania 1913. Professor of Physiology, Harvard School of Public Health. Assistant Dean, Harvard School of Public Health. Address: 55 Van Dyke Street, Boston. Their subject is "The Dog's Gift to the Relief of Suffering." Page 489.

WEISS, SOMA. A.B., M.D. Cornell University Medical College 1923. Associate Professor of Medicine, Harvard University Medical School. Director of the Second and Fourth (Harvard) Medical Services and Associate Physician of the Thorndike Memorial Laboratory of the Boston City Hospital. His subject is "The Use of Ephedra in Asiatic Medicine and Rituals." Page 494. Address: Boston City Hospital, Boston.

TARTAKOFF, JOSEPH. M.D. Tufts College Medical School 1929. Interne, Worcester City Hospital. Assistant Resident Surgeon, Mount Sinai Hospital, New York. Address: Mount Sinai Hospital, New York. Associated him is

VIBBER, FOSTER L. M.D. Tufts College Medical School 1929. Interne, Worcester City Hospital. Clinical Assistant, National Hospital, Queen Square, London. Address: Worcester City Hospital, Worcester. Their subject is "Rabies Vaccine Encephalomyelitis." Page 497.

COLBY, FLETCHER H. B.S., M.D. Harvard University Medical School 1918. Associate Urologist, Massachusetts General Hospital. Assistant in Surgery, Harvard Medical School. Assistant Surgeon, Palmer Memorial and Huntington Memorial Hospitals. His subject is "Progress in Urology." Page 499. Address: 205 Beacon Street, Boston.

AN IMPENDING COMPLICATION AFFECTING MEDICAL PRACTICE*

COMMITTEE ON STATE AND NATIONAL LEGISLATION

8 The Fenway, Boston.

Dear Doctor:

One hundred and fifty-one years ago a group of physicians founded the Massachusetts Medical Society. At that time, 1781, the expectancy of life was about 35 years. Today it is about 58 years.

We point to this record with pardonable pride, and the creating of a State Board of Health in 1869 and of a Board of Registration in Medicine in 1894 prove a continued effort for the public welfare and health.

Scientific medicine has always adopted those agencies and methods which tend to alleviate suffering and cure disease. The products of the animal, vegetable and mineral kingdoms are used in that form which makes them most applicable and electricity, lights, vaccines, sera and diet are also used when indicated.

Massachusetts has three Class A schools, and, with the above-mentioned record, feels that her citizens are best cared for in the accepted manner of modern scientific procedure and needs no lowering of present standards to permit midwestern schools to place chiropractic graduates legally in practice here.

Use every effort to continue the present standard.

Sincerely yours,

H. G. STETSON, *Chairman,*
T. J. O'BRIEN,
F. E. JONES,
A. W. MARSH,
SHIELDS WARREN, *Secretary-Treasurer.*

*Copy of a letter sent to certain physicians by the Committee on State and National Legislation of the Massachusetts Medical Society.

MISCELLANY

LOWELL'S TYPHOID PROBLEM

With fifteen cases of typhoid fever reported this year, of which number fourteen have been found since last May, the agent of the city board of health is trying to find the source of the infection.

Thus far examination of the water and milk supply has not been productive of results and further studies are being carried on to find, if possible, whether a carrier may be responsible for the disease.

With the present knowledge of the etiology of typhoid, it is probable that the problem will be solved before long, although patient and persistent detective activities do not always succeed in proving the origin of the disease.

A RADIO MESSAGE PREPARED AND SPONSORED BY THE COMMITTEE ON PUBLIC EDUCATION OF THE MASSACHUSETTS MEDICAL SOCIETY FOR THE DEPARTMENT OF PUBLIC HEALTH

COMMUNICABLE DISEASES*

BY GAYLORD W. ANDERSON, M.D.

Historically speaking, man's attempts to prevent the spread of communicable diseases represents the beginning of public health. Their control and prevention have been the aim through generations and centuries beginning with the early tribes. In primitive civilizations they may not always have been thought of in terms of communicability from man to man, but rather as plagues and pestilences. Control measures were determined according to man's intellectual development and the theories which he held as to the occurrence and mode of spread of these diseases. Primitive tribes have interwoven them with their religion, considering them either as the work of the evil spirit or the punishment of the offended deity. Modern man, however, attempts by accurate observations coupled with laboratory research to learn the exact nature of each disease, the reason for its occurrence, and the mode of spread. Given this knowledge, control measures may be adapted according to the peculiarities of the disease in question. Just as each disease is distinct from every other disease, so must the control measures be modified to suit the particular disease.

The epoch-making work of Pasteur during the last half of the nineteenth century opened entirely new fields for scientific development of communicable disease control. With the recognition of the fact that these diseases were caused by definite germs, we were able to throw off many of our ideas of miasms and foul vapors. The idea of plague and pestilence receded into the background and definite support was given to the idea of communicability. This meant briefly that we learned to think of these diseases not so much as related to the environment in which man lived but as infections spread from one individual to another. This conception is fundamental for the development of effective control measures for it permits us to concentrate our attention on the real source of infection.

Coincidental with the realization of the communicable nature of these diseases, there developed an appreciation of another important factor, the resistance of the individual. It was no new idea that some persons were resistant to certain dis-

*Broadcast: June 28, 1932. Time 4:20 P.M. Station WBZ. Place: Hotel Bradford, Boston.

eases, or that some diseases left a person protected against further attacks of this same disease. Jenner late in the 18th century had introduced vaccination, which is, after all, merely a means of artificially producing a resistance against smallpox. It remained for Pasteur to initiate a scientific study of these factors of resistance, and point the way for far-reaching studies which are still progressing. This idea of preventing the spread of diseases through increasing the resistance of those who might be exposed to them, thus opened up a vast field for the development of control measures.

At the present time our attempts at control can be divided in general into three classes, each based on a recognition of the special nature of the disease in question and modified to fit these characteristics. In some diseases prime importance must be given to one measure, in others this may be largely a failure, yet much may be accomplished through a different channel.

The first of these measures is an attempt to prevent the spread of the germs from the sick to the well. Isolation of the sick and quarantine of the contacts have this as their objective, and are designed to last until there is a reasonable certainty that the individual is no longer giving off the germs of the disease. Burning of the sputum of the tuberculosis patient, and even covering the mouth when coughing or sneezing have the same purpose. Typhoid fever is caused by taking the typhoid germs into the mouth, usually in water, milk or food. These germs are, in turn, given off in the discharges of the patient or carrier. Control rests, therefore, upon attempts to prevent the introduction of these germs into water or milk supplies, through proper sewage disposal, and regulation of carriers, coupled with measures to kill those germs which may slip through the barriers that have been erected. Thus many water supplies may be filtered or chlorinated, and milk may be pasteurized. Here in Massachusetts over 96% of the population enjoys the protection of supervised public water supplies and over 80% of the milk is pasteurized. Is it any wonder then that year after year our typhoid rate is one of the lowest in the country, and last year was probably the lowest in any state, only 250 cases and 30 deaths for four and a quarter million population?

With some diseases, as typhoid, such attempts to intercept the germs as they pass from one individual to another are very successful. With others, although they unquestionably prevent many cases and contribute to control, they are far from perfect. Here we must fall back on our second type of control measure, increasing the resistance of the individual to the disease. Vaccination against smallpox is too well proved and established to need more than passing mention. It is our only protection and whenever tried has never been found wanting. Wherever compulsory vaccination has been enforced, smallpox has disappeared. From no other disease have we a protection so well tried and so perfect. More recent in development has been the use of toxin-antitoxin or toxoid to protect a child against diphtheria. Here also we are blessed with a method which is sure, safe and effective. Through its use some communities have virtually rid themselves of diphtheria. Every case of diphtheria today means simply that the parents of that child have failed to afford it the protection to which it was entitled.

Finally for those diseases which cannot be controlled through interrupting the spread of the germs, or increasing the resistance of the individual, we must fall back on measures to guard against the ill-effects and damage caused by the disease when and after it has occurred. Measles and whooping cough can rarely be prevented, yet through proper care the complications which cause so many deaths may be avoided. Infantile paralysis is so dreaded not because of the deaths that it causes but because of the crippling that so often follows in those that survive. Prompt treatment of the sick, and patient, regular care of the paralyzed will do much to restore the weakened muscles to their normal function. Perhaps at some future time we may learn more of the secrets of these diseases and develop control measures such as we have outlined for other diseases. We all hope so. Until such time, however, we must do the best we can realizing that imperfect as our measures may be, much can be accomplished through diligent application of means now at our disposal.

Such are the methods which the public health officer and the physician use in attempts to control the spread of communicable disease. No one alone is perfect in itself and each to a large degree supplements the others. Through an intelligent combination of these methods some of the diseases can be absolutely prevented, and many cases of other conditions avoided. For this, however, the coöperation of the public is essential; without this coöperation nothing can be accomplished. Are you doing your part to help out?

TOMATO JUICE AS A HEALTH FACTOR

EXCERPTS FROM A PAPER BY DR. WALTER H. EDDY, OF COLUMBIA UNIVERSITY

The inherent qualities of tomato juice as an important factor in maintenance of health and treatment of disease have been substantiated by so many authoritative sources that physicians may well give the established evidence careful study.

Not only have dependable authorities established the rich vitamin content of tomatoes and tomato juice, but they have also shown that the ordinary commercial brands of tomato juice put up in glass or tin containers retain to a very high degree the vitamin efficiency and corrective properties of the fresh vegetable. This is important in that it increases greatly the convenience and availability of an inexpensive natural product.

VITAMINS PRESENT IN PRESERVED TOMATOES AND JUICE

I summarized results of experiments made with the assistance of E. F. Kohman and Celia Fall, of Columbia University, in a report, June 16, 1930, as follows:

"The Vitamin A content of tomatoes is practically unaffected by the commercial processes to which tomatoes and tomato products are commonly subjected. It is removed if the pulp is filtered out.

"The Vitamin B content of tomatoes is apparently somewhat affected by certain processes where excessive exposure to oxygen is not avoided. Filtering with Celite lowered the Vitamin B content, but it was not definitely established that this was due to absorption by the Celite.

"Vitamin C in tomatoes is apparently quite stable to heat if oxidation is avoided."

"The Modern Hospital", on page 205, Vol. 7, concisely summarizes other experimental findings with its statement that the packed tomato is much fresher than the "fresh" vegetable bought at the market, and of finer flavor, because, it is explained, the commercial packers of tomato products necessarily buy in large quantities direct from fields adjacent to the cannery in order to save loss of moisture content, and because, when the packer gets his tomatoes, he immediately cans the choicest of them with utmost speed, thus preserving the flavor and quality and preventing the damage which is unavoidable when the crop is handled and rehandled.

Another advantage gained in the use of packed tomatoes, tomato juice, etc., is that these products are subjected to heat in their preparation.

"The process of preserving food by heat," says Dr. E. O. Jordan, Professor of Bacteriology of the University of Chicago, "possesses the enormous advantage that the vast majority of the known disease germs are killed by even a few minutes exposure to the temperature of boiling. The use of cooked food, therefore, constitutes one of our greatest safeguards against the entrance of disease germs and other parasites through the mouth.

Other facts set forth in favor of the canned or bottled natural food products are:

1. Chemical preservatives are unnecessary when foods are properly sterilized.

2. Sanitary conditions in commercial packing plants in the United States rank very high.

3. As far as flavor is concerned, the difference between commercially packed foods and the raw products is much the same as between cooked and raw foods.

4. All waste material having been trimmed away, there is economy in the fact that the entire contents purchased is usable.

5. Oxidation, which destroys the vitamins, is not permitted to operate in commercial packing as it does in open kettle cooking.

The evidence is therefore very conclusive that packed tomatoes and tomato juice will meet the requirements of the medical profession adequately for any cases where these materials prove themselves useful.

EXPERIMENTS PROVE VALUABLE VITAMIN CONTENT OF TOMATO JUICE

The individual perhaps most responsible for the wide acceptance of tomato juice as a beneficial factor in diet is Dr. Alfred Hess. Desiring to increase the use of Vitamin C in infant feeding (to protect against scurvy), and seeking a substitute for orange juice which might be more within the financial reach of many families, he began experimenting with tomato juice. Its richness in Vitamin C, its ability to blend with milk and its palatability were demonstrated by careful experiments with infants. This work gave it the possibility of becoming one of the physician's best allies as an antiscorbutic.

NATURE OF IMPORTANT VITAMIN C

To emphasize the importance of Vitamin C we may quote from the excellent summary found in the U. S. Department of Agriculture's Circular No. 84, prepared by senior chemist Sybil L. Smith:

"The complete absence of Vitamin C from the diet of man and of the guinea-pig and certain other animals leads to the well-known disease, scurvy. This disease, characterized by soreness and stiffness of the joints, with a tendency to hemorrhage, soreness of the gums with loosening of the teeth, and fragility of the bones, was formerly somewhat prevalent among babies and almost universally appeared among adults in times of a famine or on long sea voyages. On diets deficient but not entirely lacking in Vitamin C, children become irritable and lacking in stamina, do not grow normally, and are less resistant to infectious diseases. Shortage of Vitamin C is thought also to be an important factor in the prevalence of tooth decay and of much of the so-called rheumatism in children and adults. As the capacity of the body to store Vitamin C is very limited and as this vitamin, under certain conditions, is very easily destroyed by heat and oxidation, the diet for all ages, but particularly for children, should include an abundance of Vitamin C containing foods."

Dr. E. V. McCollum, in "The Health Bulletin", June 1928, N. C. State Board of Health, says that the special processes of modern canning do not destroy Vitamin C as does ordinary cooking. "As for the other vitamins in canned foods", he adds, "it may be said with confidence from data available that these are not destroyed in canning to an appreciable extent."

Givens and McCluggage found that packed tomatoes after three years were practically the equivalent of raw tomatoes as an antiscorbutic.

One of our most recent experiments with tomato juice has established some interesting facts concerning the content of this highly important vitamin in the available commercial products.

PRESENCE OF VITAMIN C IN TOMATO JUICE

Tomato juice packers generally assume, because all fresh, ripe, sound tomatoes naturally contain ap-

preciable amounts of this water-soluble vitamin that this factor would be equally plentiful in the juice made therefrom, and most packers, while recognizing the necessity of extracting and packing the juice so as to preserve a high Vitamin C, also give special attention to inclusion of a proper proportion of the pulp in which resides the other highly important Vitamins A and B.

In an experiment under my direction, juice made from good quality, recent pack No. 10 canned tomatoes pressed through one of the standard, commercial-type juice extractors, all equipment and conditions relative to the preparation and packing duplicating commercial conditions, it was established that juice subjected to mechanical dispersion to produce homogeneity and juice not so treated, were equally potent in Vitamin C. Growth rates as well as autopsy scores of bones, joints, etc., were taken on animals, the growth period being ninety days.

Three cubic centimeters of homogenized juice were nearly protective against scurvy. Since the tomato stock used had already been through one packing and sterilizing process in its first canning operation where the amount of exposure to air and heat was beyond the experimenters' control, it is a significant fact that the juice of these tomatoes, subjected to another such operation in the experimenter's laboratory still retained this high potency of Vitamin C content.

It was also established in these tests that the glass container is quite as effective as the tin container in preserving the vitamin content of the juice.

TOMATO JUICE RICH IN VITAMIN A

We now come to a consideration of the Vitamin A content of tomato juice. We again draw upon the U. S. Department of Agriculture's Circular No. 84 for a concise summary of functions of this Vitamin A, the antixerophthalmic, antiophthalmic, or antiinfective vitamin.

"It is essential for growth, well-being at all ages, and successful reproduction. A deficient supply of this vitamin leads to weakening of the body tissues and increased susceptibility to bacterial infection, particularly of the epithelial tissues. Its complete absence from the diet of experimental animals is followed by characteristic changes in these membranes throughout the body. The most conspicuous is the condition of the eye, generally spoken of as xerophthalmia or ophthalmia. Probably of more frequent occurrence, although not so readily detected, are abscesses at the base of the tongue. Inflammation and pus formation in the ears and sinuses, and lung, skin and bladder infections are a common occurrence in these animals. It has been suggested that similar inflammatory processes in the human body may be due to decreased resistance to infection resulting from the deficiency of Vitamin A.

"Fortunately the body has the power of storing this Vitamin to a considerable extent for future needs. An abundant supply of it in early life undoubtedly safeguards the body against later infection as well as provides for present needs. This does not mean, however, that the need for Vitamin A is confined to the young. An amount sufficient to support normal growth and health may still be insufficient for the added demands of reproduction and lactation and for resisting the infections more common in early adult life. Long-time feeding experiments conducted on rats have shown increasing benefits throughout succeeding generations in the continued use of liberal amounts of Vitamin A."

H. Steenbock and I. M. Schrader in the Wisconsin Agricultural Experiment Station Bulletin 420, 76-77, 1931, state that a remarkably potent source of Vitamin A is the pulp portion of tomato juice, and also confirm that the tomato, tomato juice containing pulp, and the tomato pulp are all rich sources of the anti-scurvy Vitamin C.

Morgan and Smith have reported that green picked tomatoes do not have their full Vitamin A potency but acquire it upon subsequent ripening.

GOVERNMENT GUARDS TOMATO JUICE QUALITY

The U. S. Department of Agriculture has provided for an ample part of the Vitamin A bearing pulp being retained in the commercial preparation of tomato juice by its insistence that any product bearing the label "tomato juice" shall conform to the following definition:

"Tomato juice is the unconcentrated, pasteurized product, consisting of the liquid, with a substantial portion of the pulp, expressed from ripe tomatoes, with or without the application of heat, and also with or without the addition of salt."

This ruling dispels the rather prevalent notion that tomato juice purchased in glass or tin containers is merely the by-product of the tomato packing process.

It assures the user that any packer labeling his product "Tomato Juice" is under the compulsion to make this juice from choice, whole ripe tomatoes. It is common knowledge that in such manufacturing processes the tomatoes are thoroughly washed and passed through special crushing and screening operations which mix well together the proper portions of the fleshy cell walls and the watery juice from the seed pockets. This process also removes the seeds, cores and skins as well as any green pulp, the presence of which even in small quantities, food technologists agree, ruins the flavor of the entire batch.

The only addition to this process which differentiates the product of one packer from another is that of viscolization or homogenization previously mentioned, whereby a smoother, finer blending together of the tomato fibre and the liquid is accomplished. In this final stage the mixture is passed through a process wherein the pulp is broken up so finely that it remains in permanent uniform suspension in the liquid.

The whole juice, then, is an even mixture of those elements that commonly contain the respective Vitamins A, B and C. Moreover, this juice, not having separated out into yellowish watery part and reddish pulp part retains as a whole an appealing color approximating that of the natural fruit and does not excite uncertainty in the mind of the patient as to whether it is in proper condition for the purposes for which it was prescribed.

VITAMIN B ALSO FOUND IN TOMATO JUICE

The presence of the Vitamin B content is also assured by these processes wherein a proper balance is maintained between pulp and watery portions of the juice.

The U. S. Department of Agriculture's Bulletin No. 84 gives a concise review of Vitamin B Characteristics as follows:

"Vitamin B, formerly known as water soluble B, or growth-promoting water-soluble Vitamin, is now called the Vitamin B complex. For many years the term Vitamin B was used to denote what was thought to be a single substance essential for the stimulation of appetite and the promotion of growth in rats and other animals. It was at first thought to be identical with the antineuritic vitamin which prevents and cures polyneuritis in pigeons and fowls and possibly beriberi in man. Now it is generally believed that Vitamin B is made up of at least two independent vitamins. One of these is the antineuritic vitamin which is fairly easily destroyed by heat. The other is a vitamin much more stable to heat than the antineuritic vitamin and differs from it markedly in its physiological properties.

"British investigators have retained the name Vitamin B for the complex and have assigned the letters B and B2 to the relatively heat-liable and heat-stable factors, respectively. In this country they are most often referred to as Vitamins F and G.

"Vitamin B in its original sense, or the Vitamin B complex, has been considered to be essential for the maintenance of appetite, growth, reproduction, lactation, proper functioning of the digestive tract and resistance to bacterial infection. Its complete absence from the diet of experimental animals is followed in a short time by loss of appetite, rapid loss of weight, and death, sometimes, but not always preceded by nerve degeneration. The rapidity with which symptoms of Vitamin B deficiency become apparent indicates that the body has only a limited capacity for storing this vitamin. Laboratory experiments have shown that Vitamin B is especially important for lactation. Lactating women must therefore have a sufficient supply of this vitamin to stimulate the secretion of milk and to transmit as much as possible in the milk to the growing young. . . . Foods rich in Vitamin B may be assumed to contain relatively large proportions of both F and G, whereas those deficient in Vitamin B may be deficient in both F and G or in only one of the two.

"Vitamin F (or B), the antineuritic vitamin, is the relatively heat-liable, water-soluble vitamin essential for the prevention of polyneuritis in pigeons and fowls, a similar condition in rats, and possibly beriberi in man. Its complete absence from the diet of experimental rats is followed by loss of appetite, rapid loss in weight, and a condition of nervousness and irritability usually followed by spasms and paralytic seizures. Recovery following the administration of a rich source of this vitamin will take place with dramatic rapidity.

"As compared with its ability to store Vitamin A, the body has only limited capacity for storage of Vitamin F, therefore the diet should contain an abundance of it at all times. Probably the special need of the Vitamin B complex for lactation is chiefly for Vitamin F, and for this reason the diet of lactating women should be especially rich in Vitamin F.

"Vitamin G (or B2), sometimes known as the antipellagric vitamin, is the relatively heat-stable, water-soluble vitamin so closely associated in occurrence and properties with the antineuritic Vitamin F that for many years its independent existence escaped observation. A deficiency of this vitamin from the diet of rats is followed by rapid retardation of growth and loss in weight. Several weeks later this is followed by soreness of the eyes and mouth, and occasionally of the nose. Instead of becoming nervous and irritable, as in the case of deficiency of Vitamin F, the rats become weak and lethargic. In the last stages of the disease, diarrhea with blood discharges is common. With less complete deprivation of Vitamin G, skin lesions are more prominent. The fur becomes soft and dry and pulls out or is rubbed off easily revealing cream-colored or yellow crust on the skin usually in bilaterally symmetrical positions. Occasionally there are rough red areas on the paws.

"The tissues of rats succumbing to a deficiency of Vitamin G show, on histological examination, a striking resemblance to lesions in human pellagra. On account of this similarity in lesions, external and internal, and the fact that substances relatively rich in this vitamin are effective in the prevention and cure of pellagra, many are of the opinion that pellagra is a deficiency disease caused by lack of Vitamin G. The evidence on this point is not entirely convincing, but suggests that lack of this vitamin may be at least one of the predisposing causes of human pellagra."

Osborn and Mendel reported tomatoes as being rich in Vitamin B as well as potent in Vitamin A.

RICH, BALANCED VITAMIN CONTENT OF TOMATOES AS COMPARED WITH OTHER FOODS

The U. S. Department of Agriculture in its Circular No. 84 gives a very complete résumé of information available on relative vitamin content of a very exhaustive list of good products. The ratings are not attempted on the basis of strictly quantitative comparisons, but the classification into three

groups is valuable and sufficiently accurate determination of relative content for practical purposes.

The symbols used are as follows:

\+ indicates that the foods contain the vitamin
++ indicates that the food is a good source of the vitamin
+++ indicates that the food is an excellent source of the vitamin
— indicates that the food contains no appreciable amount of the vitamin.

Below are the ratings of several of the food products commonly associated with tomatoes and tomato juice in infant feeding and in adult dietary treatment. It will be seen that the rating of tomatoes ranks very high as a triple-vitamin product containing a remarkably balanced content of all the three vitamins, A, B and C. This with their wide availability and low cost makes them a valuable resource for consideration in all treatments and diet recommendations involving correct vitamin consumption.

	A	B	C
*Tomatoes, ripe, canned	++	++	++ to +++
Grapefruit (or juice), fresh	+	++	+++
Lemons (or juice), fresh	+	++	+++
Orange juice, fresh	++	++	+++
Cabbage, head, raw	+	++	+++
Carrots, raw, young	+++	++	++
Lettuce, head	+ to ++	++	+++
Peas, green canned	++	+ to ++	++
Spinach, canned	+++	+	+ to ++
Milk, cow's whole, pasteurized	+++	++	— to +
Cod-liver oil	+++	—	—

*Experiments have shown that while certain processes that include the beating of tomato juice by baffles, thereby introducing air bubbles that are entrapped by the pulp, may result in considerable loss of Vitamin C content, tomato juice that is obtained in a quiet way or even that which is beaten while hot suffers comparatively little destruction of Vitamin C.

NOTICES

CHANGE OF DUTY AND STATION OF COMMISSIONED OFFICERS OF THE UNITED STATES PUBLIC HEALTH SERVICE IN NEW ENGLAND

Surgeon Edward C. Ernst. Directed to proceed on August 27, from Washington, D. C., to New York City and Boston, Mass., and return, for conferences regarding Employees' Compensation work in those cities.

Assistant Surgeon C. T. Meacham. Relieved from duty with the U. S. Coast Guard and assigned to duty at the U. S. Marine Hospital, Boston, Mass.

REMOVAL

Lawrence T. Hopkins, M.D., announces the moving of his office to 153 Watson Road, Belmont, Massachusetts.

SOCIETY MEETINGS
CONGRESSES AND CONFERENCES

September 19-22 — International Congress of Biliary Lithiasis. See notice on page 427, issue of February 25.

September 26, 27, 28—Eighth Clinical Congress of the Connecticut State Medical Society. See page 331, issue of August 18.

September 30, October 1—Scientific Program for Annual Meeting of the New England Surgical Society. See page 333, issue of August 18.

October 12, 13 and 14—American Academy of Physical Therapy. See notice on page 384, issue of August 25.

October 17-21—Clinical Congress of the American College of Surgeons. See page 1330, issue of June 23.

October 17-28—The 1932 Graduate Fortnight of the New York Academy of Medicine. See page 1375, issue of June 30.

October 22-24—Health Education Institute. See notice on page 47, issue of July 7.

October 24-27 — American Public Health Association. See notice on page 1321, issue of December 31, 1931.

October 24-28—Inter-state Postgraduate Medical Association of North America. See page 39, issue of January 7.

MIDDLESEX EAST DISTRICT MEDICAL SOCIETY

The program of the Middlesex East District Medical Society for the coming year is as follows:

September 28 at Bear Hill, luncheon at 1:00 P.M.
November 9 at Winchester.
January 11 at Wakefield.
March 15 at Melrose.
May, at the Meadowbrook Club, Reading.

ALLAN R. CUNNINGHAM, Secretary.

BOOK REVIEWS

Materia Medica Pharmacology and Therapeutics. By WALTER A. BASTEDO. Third Edition. W. B. Saunders Co., Philadelphia, 1932. Price $6.50.

During the past decade there have been marked and meritorious achievements in the field of Pharmacology and Therapeutics. This has consisted of the development of new drugs adding considerably to the armamentarium of the physician and also a better understanding of some of the older drugs. Starting with insulin, we have observed the development of other hormonal extracts as pituitary, gonadal and adrenal cortex. Research in the organic preparations has given us an insight into vitamin therapy as viosterol, liver therapy, ephedrine, etc. Numerous derivatives of the barbituric acid group have been added; new gaseous anesthetics as ethylene, and the whole field of therapy has been opened to the ordinary gases, oxygen and carbon dioxide. Workers are still searching for the optimum therapeutic value of the various dyes. New synthetic chemicals have been evolved as hexylresorcinol, stovarsal, tryparsamide, etc. The rôle of calcium is better understood and iron has regained its high rank viewed, however, from a fresh standpoint. The introduction of bismuth in

syphilis and thiocyanates in metallic intoxication has also been observed.

We can easily appreciate the necessity of thorough revision of existing editions of texts on this subject. Such a revision was undertaken in the preparation of this volume and that it has succeeded is evidenced by the freshness of the material and the completeness of the work. The literature has been combed and wisely interpreted. Extravagant claims so easily made by either overenthusiastic clinicians or zealous pharmaceutical houses are studiously avoided by the author.

The book is divided into three sections. The first covers generalities and the second is devoted to the action of the various drugs and therapeutic applications. There is a final section on prescription writing which is briefly but clearly written.

The reviewer does not hesitate to recommend this book to any one who is seeking a résumé of modern Pharmacology and Therapeutics.

An Experimental and Clinical Study of Pain in the Pleura, Pericardium and Peritoneum. By JOSEPH A. CAPPS. Macmillan Co., N. Y., 1932. Price $3.00.

The foreword to this monograph comes from the pen of Prof. A. J. Carlson and carries a high tribute to the author and to the method he has employed in collecting data for a contribution of real scientific merit. The physician has been confronted with pain as the most common cause of man's seeking medical aid from the very beginning of the art and science of medicine. The slow growth of accurate knowledge concerning the complex mechanisms of pain is evidence that the doctor only rarely sees his opportunity and responsibility carefully to observe the phenomena that are common happenings in his daily work. The operating needle in the hands of the doctor has accidentally touched the human diaphragm many times but in the case of the author of this monograph the common mishap struck a spark that has glowed brilliantly for twenty-five years in simple, direct and conclusive experiments. It has been demonstrated once again that it is possible for a clinician, busy in the art of medicine, to make fundamental additions to the science of medicine. For this reason, in addition to the importance of the subject matter, the monograph is a fitting addition to the Macmillan Series.

Reconstruction of the Biliary Tract. By EDMUND HORGAN. Macmillan Co., N. Y., 1932. Price $4.00.

There is no type of case that tests the skill and ingenuity of the surgeon more than the patient that requires reconstructive surgery of the biliary tract. The situation is even more trying when the damage to the bile passages is the result of an ill-conceived or improperly performed initial operation. The lesions that may cause obstruction and obliteration of the bile ducts are so varied in character that no one method of reconstruction is applicable to all cases. In this monograph the author presents all of the reconstructive operations which have been devised to restore the flow of bile into the intestines. The technical steps of the various operations are completely illustrated and the results of the operations as recorded in the literature discussed. A complete bibliography is given. This volume will be extremely useful to the surgeon as it presents material that otherwise must be culled from an extensive literature. Before attempting surgical interference in a case that may require reconstruction of the bile passages, it is imperative for the operator to familiarize himself with the many complicated, technical steps that a successful operation may entail. As the reconstructive operation must be planned at the time that the lesion in the individual case is exposed on the operating table, the operator should be thoroughly acquainted with the possible courses of procedure and the relative dangers and chances of success in each instance.

Machete: "It Happened in Mexico." By CHARLES MERRIAM. The Southwest Press, Dallas, Texas. 1932. Pp. 131. Price $2.00.

This is an unusual book. The author, a layman, gives his experiences in treating the Mexican Peons on a large sugar plantation. With only the ordinary medical knowledge of the average man, he was called on by the Peons to treat many of their ailments, real or imaginary, and many were imaginary. After a time, the author journeyed to New York and acquired a knowledge of bacteriology and minor surgery, returning, equipped to deal more understandingly with the numerous casualties among the Peons, machetes and bullets being the chief agents in use.

A graphic description is given of the Peon who nearly severed his wrist in his efforts to cut a flying bee in two with his machete. "Are you too busy to fix a small cut?" was his query, after walking three miles for medical aid.

The book is full of interesting incidents of this kind. Medical work greatly increased so that a small hospital was built, the *Practicante*, treating as many as seventy-five patients a day at times.

Apart from the medical aspects of this volume, Mr. Merriam has given us a description of the Mexican Peon, his life, his habits and psychic make-up, that has seldom been surpassed.

Traité de Physiologie Normale et Pathologique. Tome VI. Circulation. Published under the direction of G.-H. Roger and Leon Binet. Paris, Masson et Cie. 1932. Pp. 589. Price, bound, 110 francs.

The monumental work of which this is a part comprises eleven volumes, the number of contributors being about one hundred. The production of these books is a continuous process; in two instances second editions have appeared while first editions of other treatises are not yet ready. The volume before us includes sections by Demoor,

Fabre, Fredericq, Hermann, Mathieu and de Waele. Their combined labors have furnished a remarkably thorough and detailed review of the subject. The illustrations are numerous and effective. Discoveries are credited to those who made them by name and date while the actual bibliography is much more restricted; it seems, however, to be wisely selected. The French text is generally simple and clear.

As one looks through the book one is reminded that a great mass of fundamental data was secured at an early period. The subject of the Circulation has by no means ceased to present problems for research, but it is better rounded toward a full understanding than most other subdivisions of Physiology. Hence a large proportion of space is properly devoted to the classic studies of the last century. But when one looks for the very recent developments one finds that these are well covered. Among them may be mentioned the electrocardiogram, the humoral agents affecting the heart and the blood vessels, the reactions produced through the receptors of the carotid sinus and the properties of the capillaries. The technique and theory of human blood pressure measurements are very fully discussed.

American Illustrated Medical Dictionary. By W. A. Newman Dorland, M.D. Sixteenth Edition. Octavo of 1493 Pages. Philadelphia and London, W. B. Saunders Company, 1932. Flexible and Stiff Binding, Plain $7.00 net; Thumb Index $7.50 net.

This publication purports to be a complete dictionary of the terms used in medicine, surgery, dentistry, pharmacy, chemistry, nursing, veterinary science, biology, medical biography, etc. The author is a member of the Committee on Nomenclature and Classification of Diseases of the American Medical Association. Associated with him is E. C. L. Miller, M.D., of the Medical College of Virginia.

This is the sixteenth edition of the American Illustrated Medical Dictionary, revised and enlarged with 941 illustrations and 279 portraits. A special feature is the inclusion of about 3000 new words used by medical writers. The terminology conforms to the standards of the American Medical Association, Society of American Bacteriologists, American Chemical Society and other scientific bodies which have adopted definite standards. This dictionary gives information with reference to pronunciation, etymology, historical aspects, etc., of words in ordinary usage. It gives an unusual number of portraits of prominent men in medicine and in addition a concise statement of methods of treatment which will be of use to the busy practitioner.

The Medical Annual. Fiftieth year, 1932. William Wood & Company, Baltimore, Md. Price $6.00.

The present issue marks the fiftieth anniversary of the publication of this excellent Medical Annual. In celebration of this long record a special jubilee volume has been arranged to contain photographs of all the contributors over the period of fifty years. The book is also larger and even more profusely illustrated than in the past.

The general plan and arrangement of the past has been continued. The book comprises brief reviews of the outstanding contributions to medicine during the preceding year. Profuse references permit easy access to sources, and make the book an excellent starting point for more detailed knowledge. The very extensive material covered throughout the world becomes available in brief form through the careful evaluation by the reviewers.

It should be noted that William Wood & Company, now a branch of the Williams & Wilkins Company of Baltimore, will continue to be the American publishers of this book.

Growth and Development of the Child. Part III Nutrition. A Publication of the White House Conference. The Century Co., New York and London. Price $4.00.

This, one of the larger volumes so far published from the White House Conference, containing over 500 pages, is simply packed with useful and important information, consisting of a thorough study of nutrition in relation to growth and development. It is the result of one of the activities of the Committee on Growth and Development under the chairmanship of Dr. Kenneth D. Blackfan.

The subjects covered, all in great detail, include such topics as the definition of proper and optimal growth; an appraisal of the national food supply; the relation to nutrition of the various food principles—proteins and the amino acids, the carbohydrates, fat, the minerals and vitamins and water.

The remainder of the volume is taken up with a discussion of energy requirements at various ages, human milk and artificial feeding, growth and health in relation to nutrition and the choice of foods, with especial reference to dietary adaptations for geographic and racial factors.

No subject of any importance seems to have been overlooked, and each seems to have been exhaustively considered.

The Chemistry of Tuberculosis. By H. Gideon Wells and Esmond R. Long. Baltimore: The Williams and Wilkins Co., 1932. Second edition. Price $7.00.

A completely revised and modernized edition of the original monograph, published in 1923. The book is divided into three main parts which deal with the chemistry of tubercle bacilli and their products, the chemical changes and processes in the tuberculous host and the chemotherapy of the disease.

In the first division the more important findings in regard to the growth and metabolism of the tubercle bacillus, its chemical composition and specific growth products, its acid-fastness and the

chemistry of other acid-fast bacteria are presented and discussed.

The chemical changes in the tuberculous and non-tuberculous tissues of the tuberculous subject are considered in the second division, together with the chemistry of blood, pleural effusions and sputum. Chapters devoted to metabolism in tuberculosis and the urine in tuberculosis are included.

In the third division the first chapter is devoted to a consideration of the chemical basis of the therapeutics of tuberculosis, and is followed by those presenting specific therapy with organic and inorganic chemical compounds and non-specific chemical therapy. The ineffectiveness of therapy of this nature is emphasized by the last sentence in the book, ". . . the fresh air, the hygienic and dietetic measures which have been so long and favorably known must still be relied on as the main hope in the treatment of tuberculosis".

The innumerable findings of the many investigators in this field are clearly presented and ably analyzed. The book is of incalculable value to the laboratory or individual interested, primarily, in the study of tuberculosis. It offers but little for the practicing physician other than a lucid résumé of the various futile methods of specific and non-specific chemical therapy.

Anatomy of the Human Orbit and Accessory Organs of Vision. By S. Ernest Whitnall. Second Edition. Humphrey Milford, Oxford University Press. Price $6.25.

The first edition in 1921 of Whitnall's text was the outcome of a series of annual lectures given to candidates for the Oxford Diploma of Ophthalmology. The subject matter was presented in a manner to be of utility to teachers and practitioners, and the work became at once the standard text on the subject.

It is pleasing to note that the second edition carries on this tradition, brings the subject matter up to date, increases the bibliography to 650 references, and provides a comprehensive index. The use of color in many of the illustrations greatly increases their effectiveness. The new edition is indispensable to the practising ophthalmologist, and to the teacher of ophthalmology.

Reflex Activity of the Spinal Cord. By R. S. Creed, D. Denny-Brown, J. C. Eccles, E. G. T. Liddell and C. S. Sherrington. Oxford: The Clarendon Press, 1932. vi + 183 pages. Price $3.75.

From the Department of Physiology of Oxford University, under the guiding hand of Sir Charles S. Sherrington, many important papers have been issued, in the last twenty years. The work has dealt largely with the functions of the central nervous system, particularly the spinal cord. It is now a pleasure to find that these papers, previously scattered through innumerable journals, have been collected as a whole in the form of a book. In this volume there is to be found a concise account of the elementary features of reflex mechanism, particularly of the spinal cord. An excellent bibliography is appended to the work. Such a sound product from one of the foremost physiological laboratories in the world is a welcome addition to scientific literature.

Minor Surgery of the Urinary Tract. By Hermon C. Bumpus, Jr., Associate Professor of Urology, Mayo Foundation. W. B. Saunders Company, Philadelphia. Price $3.00.

A Mayo Clinic monograph, clear, short and well written. There are ten chapters in the 116 pages which describe the urological routine of the clinic, and which give such details as anesthesia, preparation of the patient, instruments and general equipment. The book also deals with caruncle of the urethra, urethral stricture, prostatic hypertrophy and cancer, bladder tumors and stones, interstitial cystitis, non-operative treatment of ureteral stones, and the Ketogenic diet treatment of urinary tract infections.

Dr. Bumpus writes well on these subjects, with the collaboration of two of the associates of the clinic. He summarizes a wide experience in this rather brief book.

BOOKS RECEIVED FOR REVIEW

Behind the Door of Delusion by "Inmate—Ward 8." Published by The Macmillan Co. 325 Pages. Price $2.00.

Bailey's Text-Book of Histology, Revised and Rewritten by Adolph Elwyn, Oliver Strong et al. Published by William Wood & Co., Baltimore. 746 Pages.

Classic Descriptions of Disease by Ralph H. Major. Published by Charles C. Thomas. 630 Pages. Price $4.50.

A Text-Book of Anatomy and Physiology by Jesse Feiring Williams. Fourth Edition. Published by W. B. Saunders Company. 601 Pages. Price $2.75.

Physical Therapeutic Technic by Frank Butler Granger. Second Edition revised by William D. McFee. Published by W. B. Saunders Company. 436 Pages. Price $6.50.

Clinical Endocrinology of the Female by Charles Mazer and Leopold Goldstein. Published by W. B. Saunders Company. 518 Pages. Price $6.00.

The Surgical Clinics of North America. August, 1932, Volume 12, Number 4. Mayo Clinic Number. Published by W. B. Saunders Company. 227 Pages.

Minor Surgery by Frederick Christopher. Second Edition. Published by W. B. Saunders Company. 998 Pages. Price $10.00.

Preventive Medicine by Mark F. Boyd. Fourth Edition. Published by W. B. Saunders Company. 532 Pages. Price $4.50.

The Sputum — Its Examination and Clinical Significance by Randall Clifford. Published by The Macmillan Company. 167 Pages. Price $4.00.